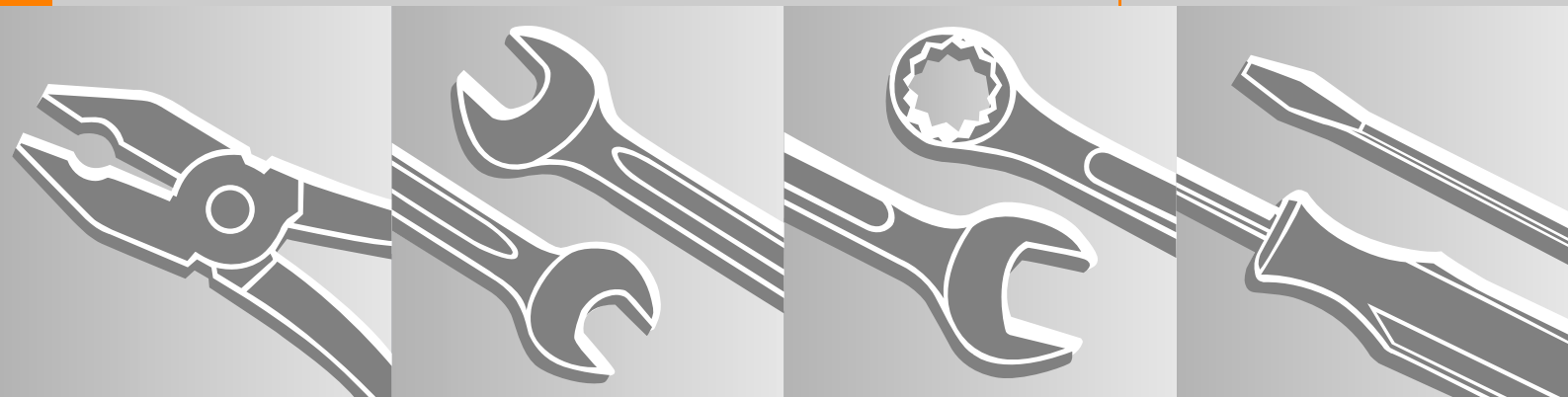


## **STIHL Series 4180 Powerhead**

2005-12



**FC 90  
FC 95  
FC 100  
FC 110  
FS 90  
FS 100  
FS 110  
FS 130**

**HL 100  
HT 100  
HT 101  
KM 90  
KM 100  
KM 110  
KM 130**

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**STIHL®**

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## 1. Introduction

This service manual contains detailed descriptions of all repair and servicing procedures specific to this powerhead.

You should make use of the illustrated parts lists while carrying out repair work. They show the installed positions of the individual components and assemblies.

Refer to the latest edition of the relevant parts list to check the part numbers of any replacement parts.

Refer to the "Technical Information" bulletins for engineering changes which have been introduced since publication of this service manual. Technical information bulletins also supplement the parts list until a revised edition is issued.

The special servicing tools mentioned in the descriptions are listed in the last chapter of this manual. Use the part numbers to identify the tools in the "STIHL Special Tools" manual.

Symbols are included in the text and pictures for greater clarity. The meanings are as follows:

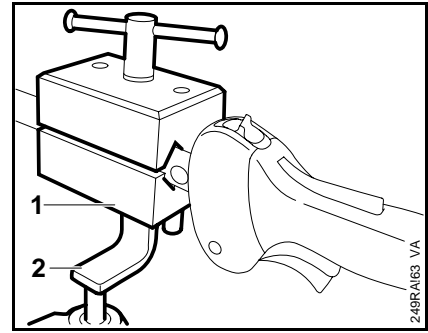
In the descriptions:

- = Action to be taken as shown in the illustration (above the text)
- = Action to be taken that is not shown in the illustration (above the text)
- 4.2 = Reference to another chapter, i.e. chapter 4.2 in this example
- = Situation applies from serial No.
- = Situation applies up to serial No.

In the illustrations:


- Pointer
- Direction of movement

Service manuals and technical information bulletins are intended exclusively for the use of properly equipped repair shops. They must not be passed to third parties.



Servicing and repairs are made considerably easier if the powerhead is mounted on assembly stand (2) 5910 890 3100 with the aid of clamp (1) 5910 890 8800. The powerhead can then be swivelled to the best position for the ongoing repair. This leaves both hands free.

### Always use original STIHL replacement parts.

They can be identified by the STIHL part number, the **STIHL** logo and the STIHL parts symbol .

This symbol may appear alone of small parts.

## 2. Safety Precautions

If the engine is started up in the course of repairs or maintenance work, observe all local and country-specific safety regulations as well as the safety precautions and warnings in the instruction manual.

Gasoline is an extremely flammable fuel and can be explosive in certain conditions.

Improper handling may result in burns or other serious injuries.

If parts are heated during servicing work, always wear suitable protective gloves.

Do not bring any fire, flame, spark or other source of heat near the fuel. All work with fuel must be performed outdoors only. Spilled fuel must be wiped away immediately.

Check for leaks after performing any work on the fuel system or engine.

### 3. Specifications

	<b>FS 90 FC 90, 95 KM 90</b>	<b>FS 100, 110 FC 100, 110 HT 100, 101 HL 100 KM 100, 110</b>	<b>FS 130 KM 130</b>
<b>3.1 Engine</b>	STIHL single cylinder four-stroke engine with mixture lubrication		
Displacement:	28.4 cm <sup>3</sup>	31.4 cm <sup>3</sup>	36.3 cm <sup>3</sup>
Bore:	38 mm	40 mm	43 mm
Stroke:	25 mm	25 mm	25 mm
Engine power to ISO 8893	0.95 kW at 7,000 rpm	1.05 kW at 7,000 rpm	1.4 kW at 8,500 rpm
Max. permissible engine speed with cut-off by ignition module:	10,500 ± 500 rpm	10,500 ± 500 rpm	10,500 ± 500 rpm
Idle speed:	2,800 rpm	2,800 rpm	2,800 rpm
Clutch:	Centrifugal clutch, two clutch shoes without linings		
Clutch engages at:	3,700 rpm	3,700 rpm	3,700 rpm
Valve clearance			
Inlet valve:	0.10 mm	0.10 mm	0.10 mm
Exhaust valve:	0.10 mm	0.10 mm	0.10 mm
Valve diameter:	13.5 mm	13.5 mm	15.5 mm
Marking:	A <sup>1)</sup> E <sup>2)</sup>	A <sup>1)</sup> E <sup>2)</sup>	B or ● <sup>1)</sup> I <sup>2)</sup>
<hr/>			
<b>3.2 Spark Plug</b>			
Type:	BOSCH USR 7AC	BOSCH USR 7AC	NGK CMR 6H
Electrode gap:	0.5 mm	0.5 mm	0.7 mm
Air gap between ignition module and fanwheel:	0.15 ... 0.30 mm	0.15 ... 0.30 mm	0.15 ... 0.30 mm
<hr/>			
<b>3.3 Fuel System</b>			
Crankcase leakage test:			
at gauge pressure:	0.5 bar	0.5 bar	0.5 bar
under vacuum:	0.5 bar	0.5 bar	0.5 bar
Carburetor leakage test			
at gauge pressure:	0.8 bar	0.8 bar	0.8 bar
Function of tank vent			
at gauge pressure:	0.3 bar	0.3 bar	0.3 bar
Fuel:	as specified in instruction manual		

#### Remarks:

- <sup>1)</sup> install at inlet side only
- <sup>2)</sup> may be installed at inlet and  
exhaust sides

### 3.4 Tightening Torques

DG and P screws (Plastoform) are used in polymer and light metal components. These screws form a permanent thread when they are installed for the first time. They can be removed and installed as often as necessary without impairing the strength of the screwed assembly, providing the specified tightening torque is observed.

For this reason it is **essential to use a torque wrench**.

Fastener	Thread size	For component	Torque Nm
Spline socket screw	IS-M6x25	Cover washer/clutch shoe/flywheel	12.0
Spline socket screw	IS-DG4x18	Cover/engine pan	4.5
Spline socket screw	IS-M5x30	Control handle/locknut with washer	2.0 <sup>1)</sup>
Spline socket screw	IS-P4x16	Control handle, inner/outer moldings	1.3 <sup>1)</sup>
Spline socket screw	IS-P4x16	Control handle, inner/outer moldings	1.3 <sup>2)</sup>
Spline socket screw	IS-M5x12	Clamp/control handle	5.0 <sup>2)</sup>
Spline socket screw	IS-DG4x18	Cover/cylinder	4.5
Spline socket screw	IS-M5x21	Filter cover/filter housing	3.5
Collar nut	M8	Filter housing/carburetor	3.5
Spline socket screw	IS-D5x24	Gear housing/drive tube	8.0
Spline socket screw	IS-M4x9.5	Screen/muffler	2.0
Spline socket screw	IS-M5x24	Shroud/cylinder	6.0
Collar screw	M5x16	Rocker lever collar screw/cylinder	9.0
Spline socket screw	IS-M6x30	Clamp/drive tube/handle support	8.0 <sup>1)</sup>
Screw	M6x30	Coupling sleeve wingscrew	6.0 <sup>3)</sup>
Spline socket screw	IS-M6x25	Coupling sleeve/nut, clamp	9.0 <sup>3)</sup>
Spline socket screw	IS-DG5x24	Engine pan/cylinder	9.0
Spline socket screw	IS-M6x25	Clamp/loop handle/nut	4.5 <sup>2)</sup>
Spline socket screw	IS-P5x14	Fan housing, axial location of clutch drum bearing	4.0
Spline socket screw	IS-DG5x24	Fan housing/shroud/engine pan	6.0
Spline socket screw	IS-DG5x24	Fan housing/engine pan	6.0
Screw	P3.5x9	Detent spring/slide control	1.1 <sup>1)</sup>
Spline socket screw	IS-M5x23	Loop handle/clamp/drive tube	6.0 <sup>4)</sup>
Spline socket screw	IS-DG5x24	Muffler/crankshaft	9.0
Spline socket screw	IS-DG5x24	Muffler/cylinder	9.0
Spline socket screw	IS-M5x16	Cutting tool deflector/gear housing	4.5
Nut	M8x1	Flywheel/crankshaft	17.0
Spline socket screw	IS-M6x14	Clamp/carrying ring	4.5
Spline socket screw	IS-M5x12	Clamp/drive tube, fan housing	6.0
Spline socket screw	IS-DG5x24	Starter cover/cover/engine pan	6.0

Fastener	Thread size	For component	Torque
Spline socket screw	IS-DG5x24	Starter cover/tank/engine pan	6.0
Nut	M8x1	Starter cup/crankshaft	17.0
Spline socket screw	IS-M5x30	Valve cover/cylinder	3.5
Screw plug	M11x10	Screw plug/gearbox	10.0
Spark plug	IS-M10x1	Spark plug	9.0
Spline socket screw	IS-DG4x18	Ignition module/cylinder	4.5
Spline socket screw	IS-DG5x32	Spacer flange/cylinder	9.0
Spline socket screw	IS-P5x14	Ball bearing/fan housing	4.0 <sup>5)</sup>

#### Remarks:

1) Version with bike handle

2) Version with loop handle

3) CombiEngine

4) FS 100 RX

5) FS 90, 100; KM 90, 100; FC 90, 95, 100

Use the following procedure when refitting a DG or P screw in an existing thread:

Place the screw in the hole and rotate it counterclockwise until it drops slightly. Tighten the screw clockwise to the specified torque.

This procedure ensures that the screw engages properly in the existing thread and does not form a new thread and weaken the assembly.

Power screwdriver for polymer: DG and P screws max. 500 rpm

Do not use an impact screwdriver for releasing or tightening screwed assemblies.

Do not mix up screws with and without binding heads.

**4. Troubleshooting**  
**4.1 Clutch**

Condition	Cause	Remedy
Tool stops at full throttle under load	Clutch badly worn	Fit new clutch
	Clutch drum badly worn	Fit new clutch drum
Tool runs at idle speed	Idle speed too high	Readjust idle speed screw (counterclockwise)
	Clutch springs stretched or fatigued	Fit new clutch
	Spring hooks broken	Fit new clutch



## 4.2 Rewind Starter

Condition	Cause	Remedy
Starter rope broken	Rope pulled out too vigorously as far as stop or over edge, i.e. not vertically	Fit new starter rope
	Normal wear	Fit new starter rope
Rewind spring broken (starter rope does not rewind)	Spring overtensioned – no reserve when rope is fully extended	Fit new rewind spring
	Very dirty or corroded	Clean rewind spring or fit a new one
Starter rope can be pulled out almost without resistance (crankshaft does not turn)	Guide peg on pawl or pawl itself is worn	Fit new pawl
	Spring clip fatigued	Fit new spring clip
Starter rope is difficult to pull and rewinds very slowly	Starter mechanism very dirty (dusty conditions)	Thoroughly clean complete starter mechanism
	Lubricating oil on rewind spring becomes viscous at very low outside temperatures (spring windings stick together)	Apply a few drops of kerosine (paraffin) to spring, then pull rope carefully several times until normal action is restored. Then coat with resin-free oil.

### 4.3 Ignition System

**Warning:**

Exercise extreme caution while carrying out maintenance and repair work on the ignition system.

The high voltages which occur can cause serious or fatal injuries!

Condition	Cause	Remedy
Engine does not run	No spark	Check operation of slide control and ignition module; replace damaged parts
	Spark plug dirty or faulty	Clean or replace spark plug
	Faulty insulation or break in ignition coil, ignition lead or short circuit wire	Use ohmmeter to check ignition coil and lead for break. If break is detected or resistance is high, fit new ignition coil and ignition lead; check short circuit wire for ground contact in run position
Engine runs roughly, misfires, temporary loss of power	Spark plug boot is loose	Press boot firmly onto spark plug, and fit a new leg spring if necessary
	Spark covered in soot, smeared with oil	Install new spark plug
	Weak spark or no spark	Faulty insulation on ignition lead or short circuit wire. Use ohmmeter to check ignition lead for break. If break is detected or resistance is high, fit new ignition lead
	Wrong air gap between ignition coil and flywheel	Reset air gap
	Flywheel cracked or damaged	Install new flywheel
	Check operation of spark plug. Check slide control, ignition coil/ wire for damaged insulation and leakage current	Clean or replace spark plug, replace damaged parts of ignition system

Condition	Cause	Remedy
Carburetor floods, engine stalls	Inlet needle not sealing. Foreign matter in valve seat or cone damaged	Remove and clean or replace inlet needle, clean fuel tank, pickup body and fuel line if necessary
	Inlet control lever sticking on spindle	Free off inlet control lever
	Helical spring not located on nipple of inlet control lever	Remove inlet control lever and refit correctly
	Perforated disc on diaphragm is deformed and presses constantly against inlet control lever	Fit new metering diaphragm
	Inlet control lever too high (relative to design position)	Set inlet control lever flush with upper face of housing or bottom of metering chamber
	After more than five starting attempts with choke shutter closed	Open choke shutter after no more than five starting attempts
Poor acceleration	Idle jet too lean	Back off low speed screw slightly
	Main jet too lean	Back off high speed screw slightly
	Inlet control lever too low (relative to design position)	Set inlet control lever flush with upper face of housing or bottom of metering chamber
	Inlet needle sticking to valve seat	Remove inlet needle and clean valve seat
	Connecting bore to atmosphere blocked	Clean bore
	Diaphragm gasket leaking	Fit new diaphragm gasket
	Metering diaphragm damaged or shrunk	Fit new metering diaphragm

Condition	Cause	Remedy
Engine will not idle, idle speed too high	Throttle shutter opened too wide by idle speed screw	Reset idle speed screw (LA)
	Intake stub leaking	Seal or replace intake stub
Engine stalls at idle speed	Idle jet bores or ports blocked	Clean jet bores and ports and blow clear with compressed air
	Idle jet too rich	Screw down low speed screw slightly
	Setting of idle speed screw incorrect – throttle shutter completely closed	Set idle speed screw (LA) correctly
Engine speed drops quickly under load – low power	Air filter plugged	Clean air filter
	Tank vent faulty	Clean the tank vent, replace if necessary
	Leak in fuel line between tank and fuel pump	Seal or renew connections and fuel line
	Pump diaphragm damaged or fatigued	Fit new pump diaphragm
	Main jet bores or ports blocked	Clean bores and ports
	Fuel pickup body dirty	Fit new pickup body
	Fuel strainers dirty	Clean fuel strainers

## 4.5 Engine

Always check and, if necessary, repair the following parts before looking for faults on the engine:

- Air filter
- Fuel system
- Carburetor
- Ignition system

Condition	Cause	Remedy
Engine does not start easily, stalls at idle speed, but operates normally at full throttle	Check compression	Check combustion chamber for excessive build-up of combustion deposits, check condition of valves and valve clearances
	Gasket on carburetor spacer flange leaking	Install new gasket
	Decompression lever sticking	Install new cam gear
	Muffler carbonized	Clean muffler, or replace if necessary
	Crankcase damaged (cracks)	Replace the crankcase
Engine does not deliver full power or runs erratically	Secondary air seepage through faulty gaskets on spacer flange	Install new gaskets
	Piston rings worn or broken	Install new piston rings
	Muffler / spark arresting screen carbonized	Clean muffler (inlet and exhaust openings), replace spark arresting screen (if fitted)
	Air filter element dirty	Fit new air filter element
	Fuel / impulse line kinked or cracked	Fit new lines or position without kinks
	Pump diaphragm torn	Install new pump diaphragm
	Decompression lever sticking	Install new cam gear

Condition	Cause	Remedy
Engine overheating	Insufficient cylinder cooling. Air inlets in fan housing blocked or cooling fins on cylinder very dirty	Thoroughly clean all cooling air passages and cooling fins

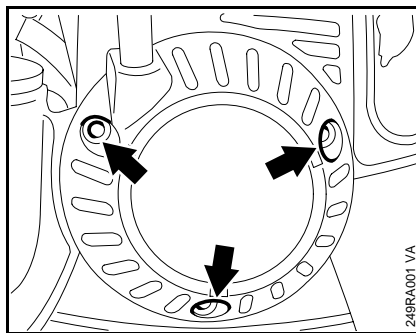
## 5. Rewind Starter/Shroud

### 5.1 General

If the action of the starter rope becomes very stiff and the rope rewinds very slowly or not completely, it can be assumed that the starter mechanism is in order but plugged with dirt. At very low outside temperatures the lubricating oil on the rewind spring may thicken and cause the spring windings to stick together. This has a detrimental effect on the function of the starter mechanism. In such a case it is sufficient to clean the rewind spring with a standard commercial cleaner and then coat it with resin-free oil.

Pull out the starter rope several times and allow it to rewind until its normal smooth action is restored.

## 5.2 Removing and Installing



- Remove the screws (arrows) from the rewind starter.

- Lift away the rewind starter.

Reassemble in the reverse sequence.

- Tighten down the screws, 3.4

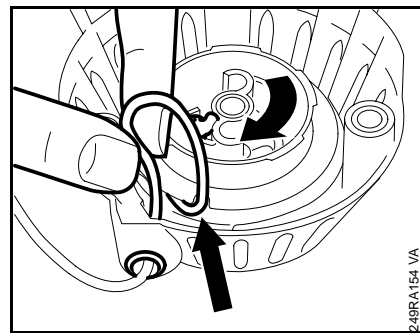
## 5.3 Rope Rotor

- Remove the rewind starter, 5.2

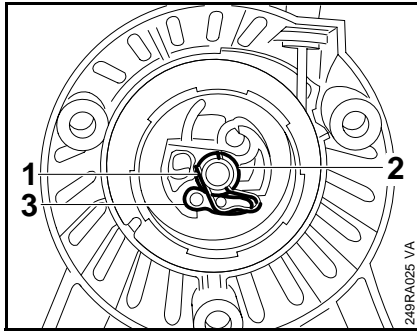
### Relieving tension of rewind spring:

The spring will not be under tension if the starter rope is broken.

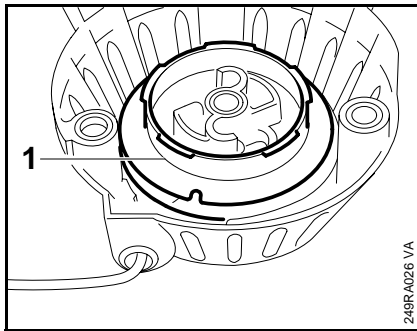
- Pull out the starter rope about 20 cm and hold the rope rotor steady.



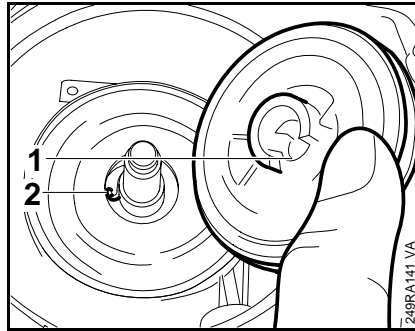
- Engage the rope in the notch on the rotor, and make a loop.
- Use the starter rope to turn the rotor clockwise until tension is relieved.



- To remove the rope rotor, ease the spring clip (1) out of the groove in the starter post.
- Remove the washer (2) and pawl (3).



- Carefully pull the rope rotor (1) off the starter post.
- To replace the rope rotor, remove the starter rope, [5.4](#)

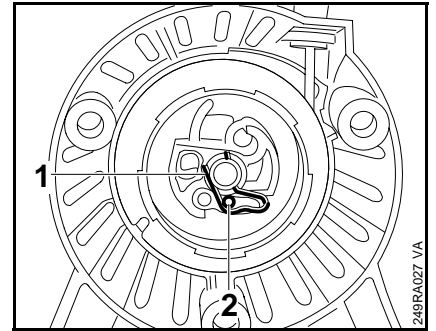


#### Installing:

Coat bore in rope rotor with STIHL special lubricant, [12](#).

- Fit the rope rotor on the starter post so that the driver (1) on the rotor slips behind in the inner spring loop (2).

Turn the rope rotor a little and let it go. It must spring back.



- Fit the pawl and washer. Engage spring clip in the groove on the starter post.


The spring clip (1) must engage the guide peg (2) on the pawl and point it counterclockwise.

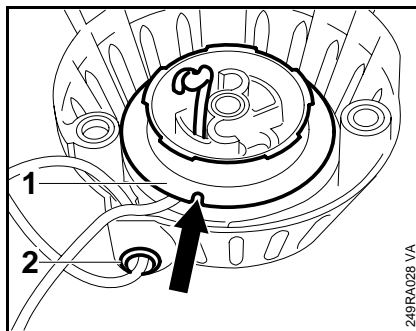
Handle the spring clip with care. The rewind starter may not function properly if the spring clip is deformed.

- Fit the starter rope, [5.4](#)
- Tension the rewind spring, [5.4.1](#)

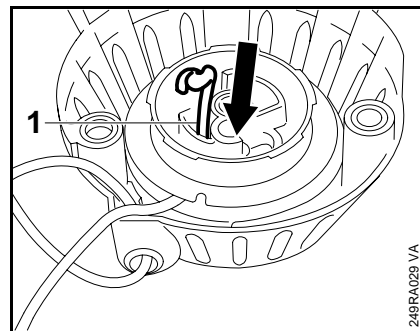



## 5.4 Starter Rope

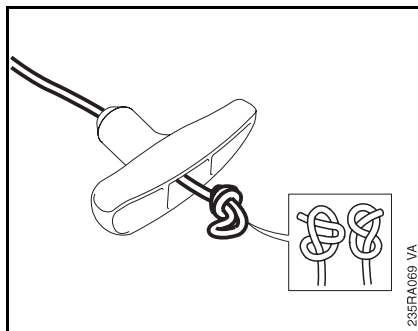
- Remove the rewind starter,  5.2
- Remove the remaining rope from the rope rotor and starter grip.



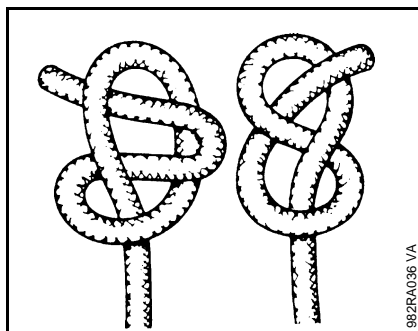
- Thread the other end of the rope through the guide bush (2) from outside.
- Thread the rope through the hole in the side of the rope rotor (1).
- Pull out the rope and secure it with a simple overhand knot.



- Pull the rope back into the rotor so that the knot locates in the recess (1).
- Tension the rewind spring,  5.4.1




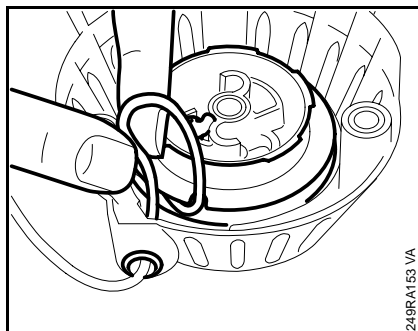
- Thread end of new rope through the underside of the starter grip and pull it out.



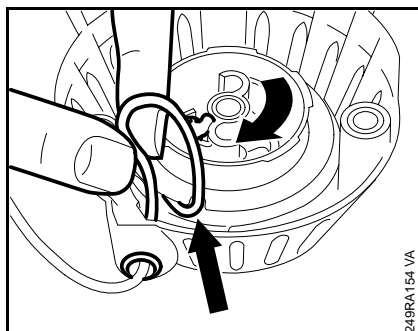
- Secure the end of the rope with one of special knots shown.
- Pull the rope back into the starter grip.

## 5.4.1 Tensioning

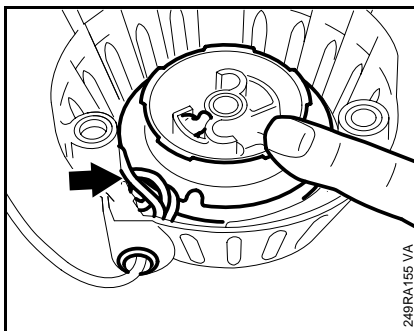
- Remove the rewind starter,  5.2



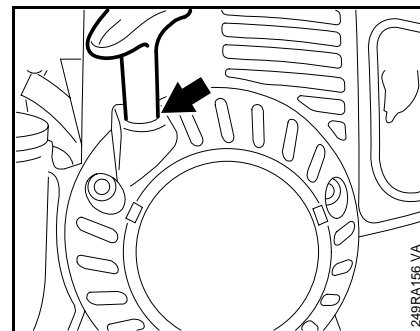
- Make a loop in the starter rope.



- Engage the rope in the notch on the rotor. Grip the rope close to the rotor and use it to turn the rope rotor six full turns clockwise.




- Hold the rope rotor steady.
- Pull out the rope with the starter grip and straighten it out.
- Hold the starter grip firmly to keep the rope tensioned.
- Let go of the rope rotor and slowly release the starter grip so that the rope winds itself onto the rotor.

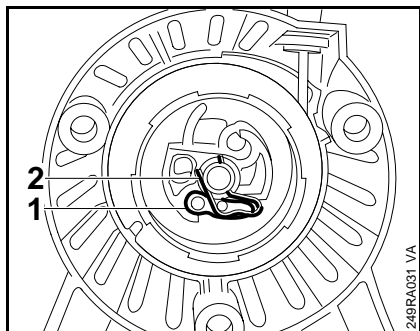


The starter grip must sit firmly in the rope guide bush without drooping to one side. If this is not the case, tension the spring by one additional turn.

When the starter rope is fully extended, it must still be possible to rotate the rope rotor at least another half turn before maximum spring tension is reached. If this is not the case, pull the rope out, hold the rope rotor steady and take off one turn of the rope.

- Install the rewind starter,  5.2

## 5.5 Pawl



- Ease the spring clip (1) off the starter post.

Do not take the rope rotor off the starter post.

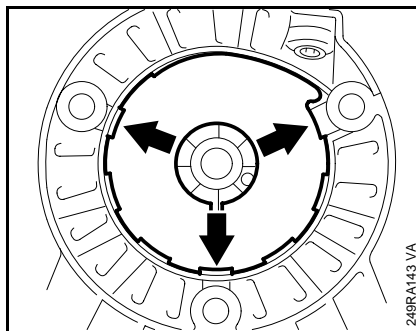
- Pull the pawl (2) out of the rope rotor.
- Lubricate peg of new pawl with grease, 12

## 5.6 Replacing the Rewind Spring

- Remove the rope rotor, 5.3

The pieces of broken spring may still be under tension and may fly apart unexpectedly when you remove them. Wear face protection and gloves to reduce the risk of injury.

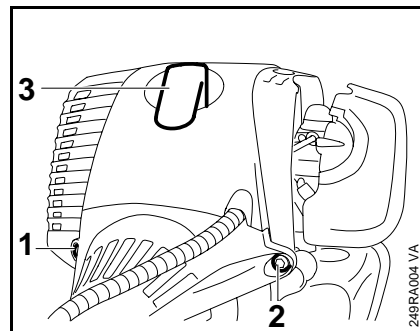
- Remove the spring housing and parts of the spring.
- Lubricate the new spring with a few drops of resin-free oil.



- Position the new spring housing (bottom plate must face up) as shown (arrows) and push it home.
- Install the rope rotor, 5.3
- Fit the starter rope, 5.4

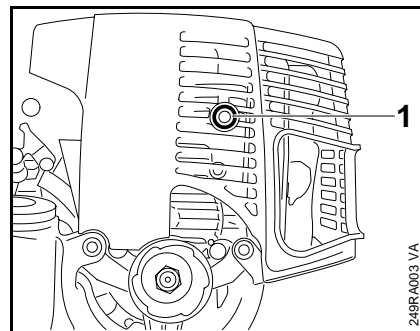
Reassemble all other parts in the reverse sequence.

## 5.7 Removing the Shroud



- Remove the rewind starter, 5.2

- Take out the screws (1 and 2).
- Carefully pull off the spark plug boot (3) vertically.



- Take out the screw (1).
- Remove the shroud upwards, and pull the spark plug boot through the shroud at the same time.

Install in the reverse sequence.

- Tighten down the screws, 3.4

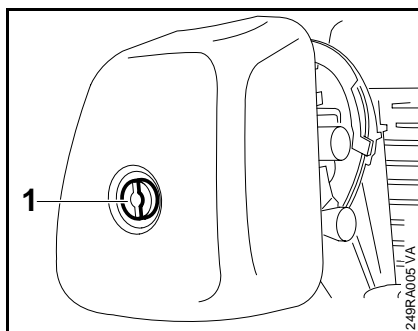
## 6. Fuel System

### 6.1 Air Filter

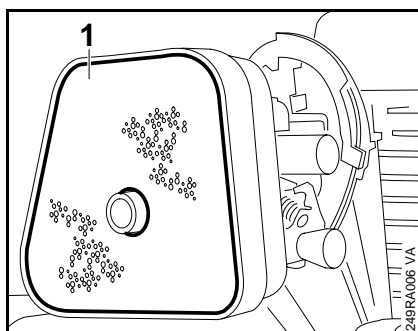
Dirty and clogged air filters reduce engine power, increase fuel consumption and make starting more difficult.

The air filter must be cleaned when there is a noticeable loss of engine power.

- Close the choke shutter.
- Clean away any loose dirt from around the filter and filter cover.

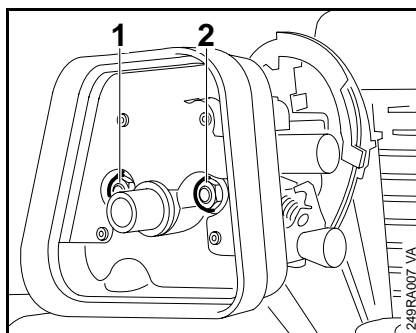


- Loosen the slotted screw (1) and lift away the filter cover.

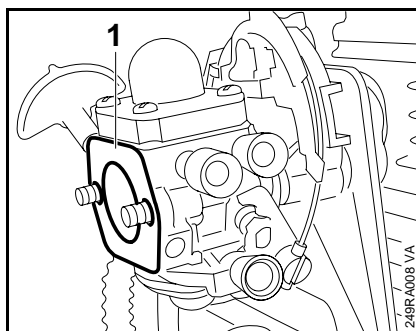


- Remove the filter (1).

The filter element is not washable. If it is heavily loaded with dirt, fit a new one.

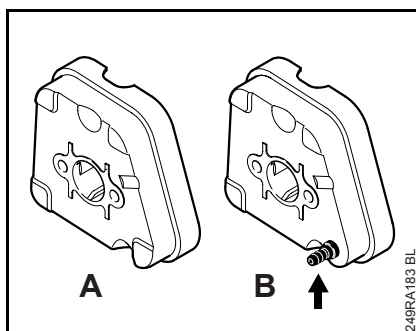


- Take out the screws (1 and 2).
- Remove the air filter housing.



- Remove the paper gasket (1) and fit a new one.

When reassembling, check that the air filter housing is of the right type:



- Air filter housing (A) **without** stub for tank vent without return line, 6.5
- Air filter housing (B) **with** stub (arrow) for tank vent with return line to clean air side, 6.5

Install air filter housing (B) **with** stub only with connecting hose to tank vent.

Unfiltered air would be sucked in if the connecting hose is not fitted. This would result in an increased rate of wear and a risk of engine damage.



Reassemble all other parts in the reverse sequence.

- Tighten down screws on air filter housing, 3.4
- Tighten down screw air on filter cover, 3.4


## 6.2 Carburetor

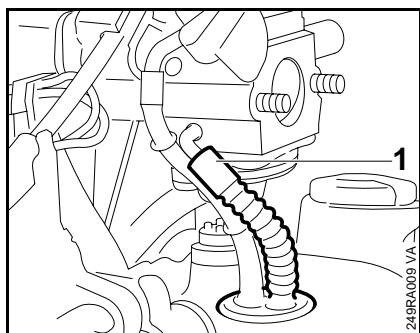
### 6.2.1 Leakage Test

Troubleshooting chart,  4.4

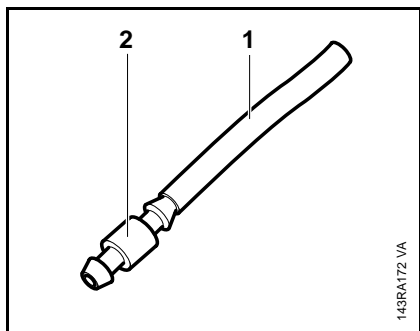
In the event of trouble with the carburetor, first check the fuel supply,  6.6, and tank vent,  6.5

The carburetor can be tested for leaks with the carburetor and crankcase tester 1106 850 2905.

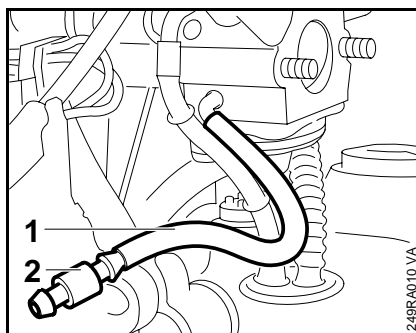
- Remove the air filter,  6.1
- Open the tank filler cap to relieve pressure.
- Close the tank filler cap.



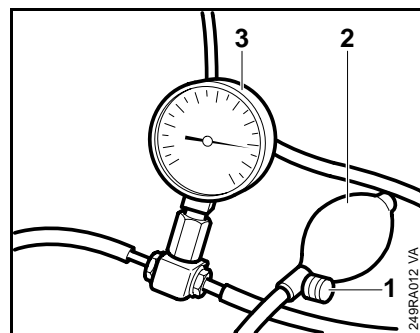
- Pull fuel hose (1) off carburetor's elbow connector.



- Push the fuel hose (1) 1110 141 8600 onto the nipple (2) 0000 855 9200.



- Push the fuel hose (1) with nipple (2) onto the carburetor elbow connector.
- Push the pressure hose of tester 1106 850 2905 onto the nipple.



- Close the vent screw (1) on the rubber bulb.
- Pump air into the carburetor with the rubber bulb (2) until the pressure gauge (3) shows a reading of approx. 0.8 bar.


If this pressure remains constant, the carburetor is airtight.

- Disconnect pressure hose and carburetor tester.
- Refit the fuel hoses.

Reassemble all other parts in the reverse sequence.

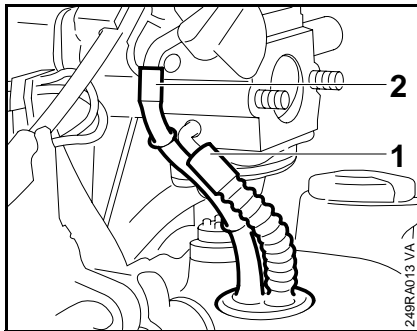
However, if the pressure drops, there are two possible causes:

1. The inlet needle is not sealing (foreign matter in valve seat or sealing cone of inlet needle is damaged or inlet control lever sticking).
2. The metering diaphragm is damaged.

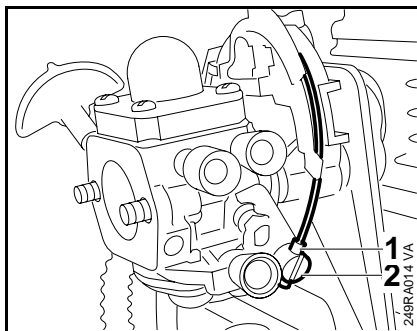
In either case the carburetor must be removed and serviced,  6.2.

- After completing test, open the vent screw on the carburetor and crankcase tester and disconnect the test hose from the carburetor.

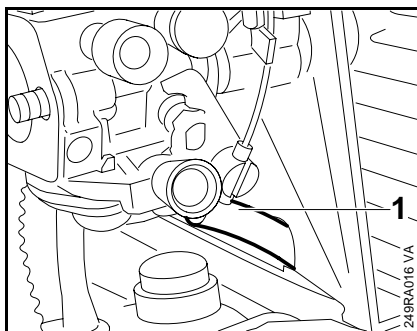
## 6.2.2 Removing and Installing



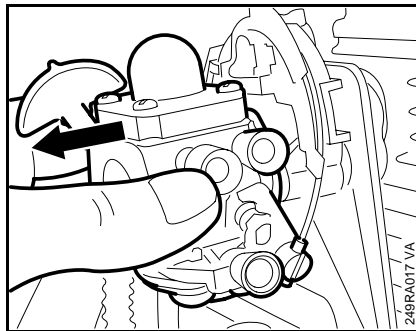
- Remove the air filter, [6.1](#)
- Pull the fuel hoses (1 and 2) off the elbow connectors.



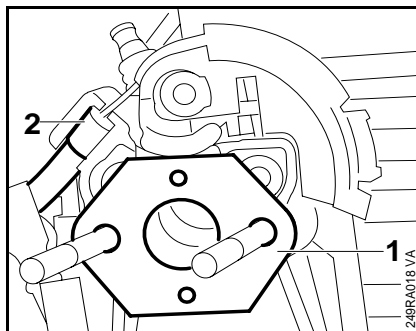
- Disconnect throttle cable nipple (1) from slotted pin (2) on the throttle lever.



- Pull the impulse hose (1) off the metering diaphragm.



- Pull carburetor off the studs.

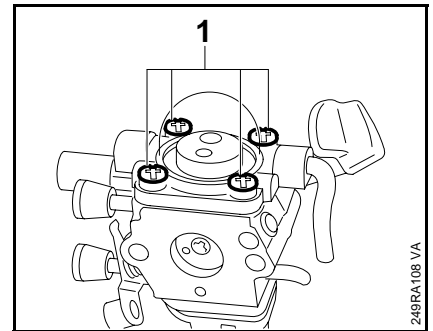


- Remove the gasket (1).
- Disconnect the cable (2).

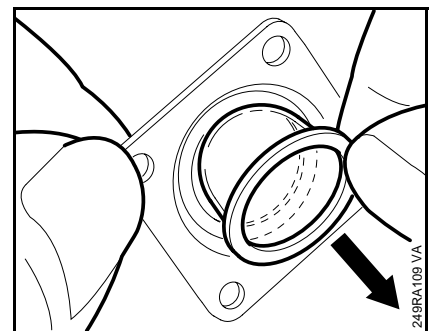
If spacer flange shows signs of damage or cracks, install a new one, [7.10](#).

Reassemble in the reverse sequence.

## 6.2.3 Manual Fuel Pump

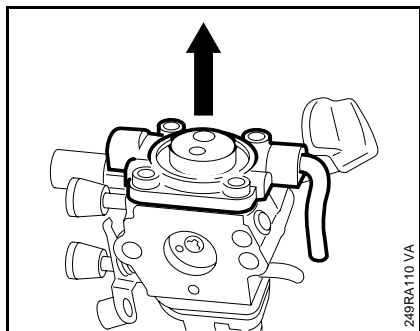


- Remove the shroud, [5.7](#)
- Perform leakage test, [6.2.1](#)
- Take out the screws (1).
- Remove end cover together with rubber pump bulb.

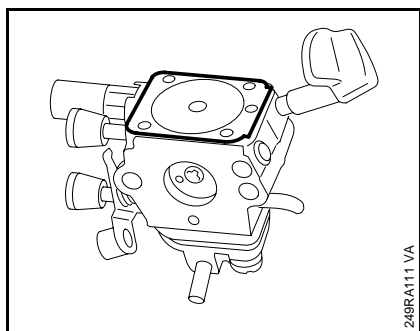


- Remove rubber bulb from the end cover.

## 6.2.4 Metering Diaphragm

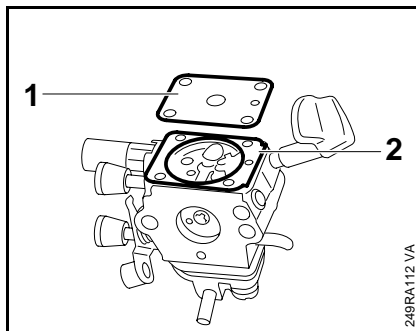


- Remove the flange.



- Examine the metering diaphragm and sealing ring. Replace if necessary, [6.2.4](#)

Reassemble in the reverse sequence.



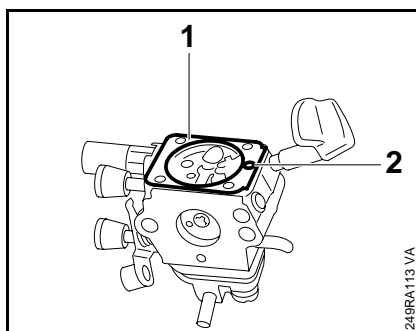
- Remove the flange, [6.2.3](#)
- Remove metering diaphragm (1) and gasket (2) from the carburetor body.

If the gasket and diaphragm are stuck together, separate them carefully.

- Check the diaphragm and gasket and replace if necessary.

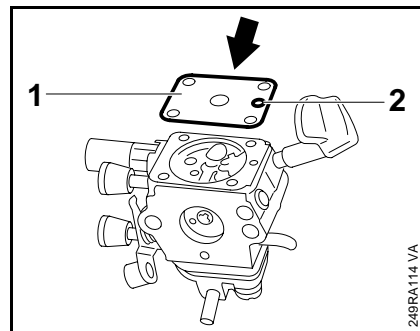
The diaphragm is the most delicate part of the carburetor. It is subjected to continuous alternating stresses and the material eventually shows signs of fatigue, i.e. the diaphragm distorts and swells and has to be replaced.

Reassemble in the reverse sequence.



- Place the gasket (1) on the carburetor body.

The cutout in the gasket (2) must line up with the compensating bore in the carburetor.

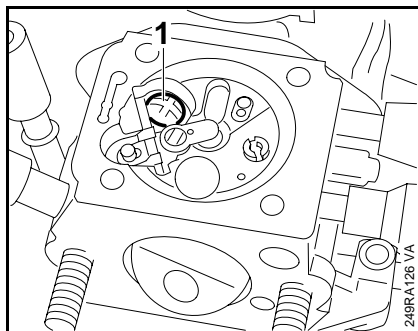


- Place the metering diaphragm (1) on the gasket.

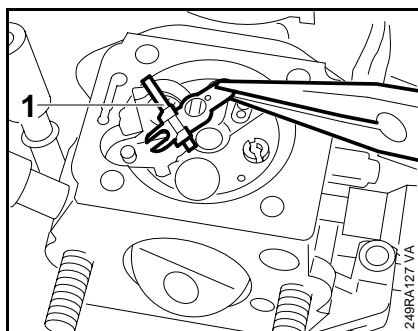
The cutout in the metering diaphragm (2) must line up with the compensating bore in the carburetor and the gasket.

Assemble all other parts, [6.2.3](#).

## 6.2.5 Inlet Needle



- Remove the metering diaphragm, [6.2.4](#)
- Remove the round head screw (1).



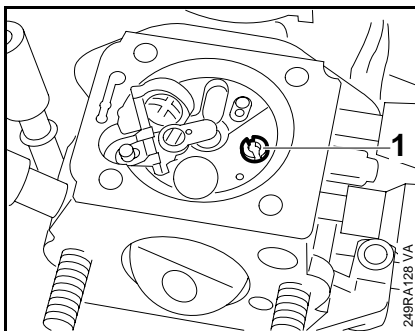
- Carefully remove the inlet control lever (1) with spindle.

Reassemble in the reverse sequence.

- Engage clevis of inlet control lever in groove on inlet needle.
- Helical spring must locate in inlet control lever's recess.

Make sure the inlet needle and spring are properly seated.

## 6.2.6 Fixed Jet

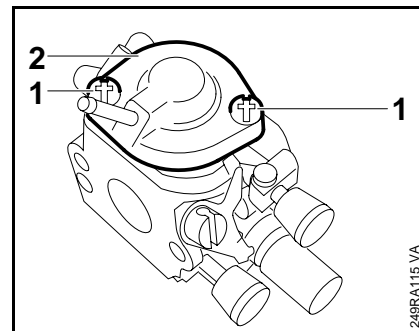


- Remove the metering diaphragm, [6.2.4](#)
- Use a suitable screwdriver to unscrew the fixed jet (1).

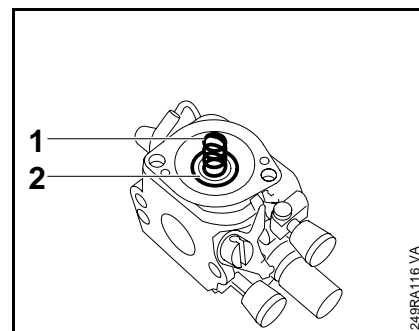
Reassemble in the reverse sequence.

Take care not to damage the fixed jet with the screwdriver during assembly and installation.

## 6.2.7 Pump Diaphragm

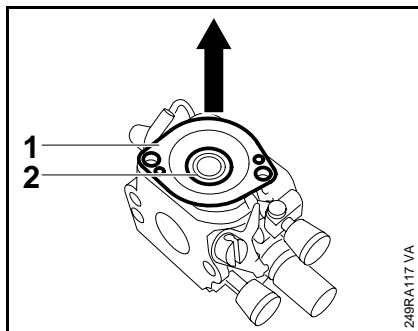


- Remove the carburetor, [6.2.2](#)
- Take out the screws (1).
- Remove the end cover (2).



- Remove the spring (1) and spring retainer (2) from the diaphragm.



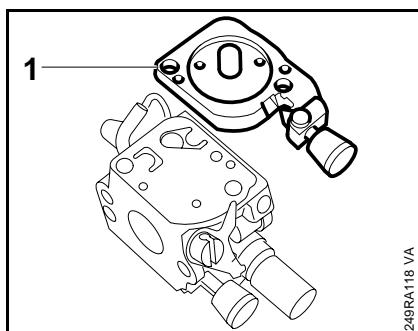


- Remove the gasket (1) and pump diaphragm (2).

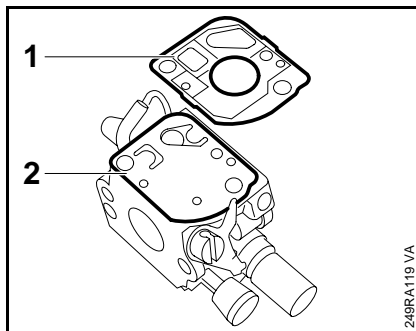
If the gasket and diaphragm are stuck together separate them carefully.

- Check diaphragm and gasket and replace if necessary.

The diaphragm is the most delicate part of the carburetor. It is subjected to continuous alternating stresses and the material eventually shows signs of fatigue, i.e. the diaphragm distorts and swells and has to be replaced.

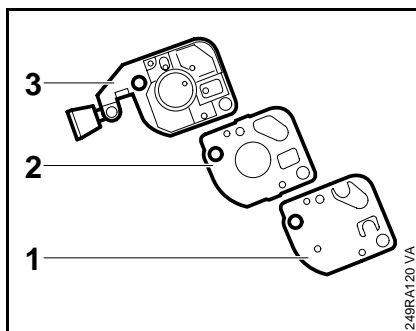


- Remove flange body (1) with idle speed screw.

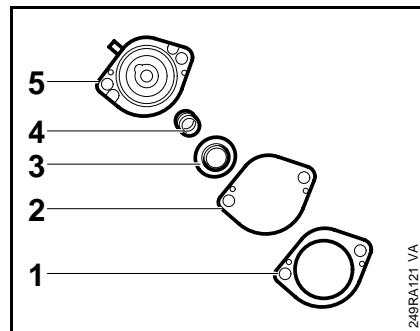


- Remove the gasket (1) and pump diaphragm (2).

Reassemble in the reverse sequence.



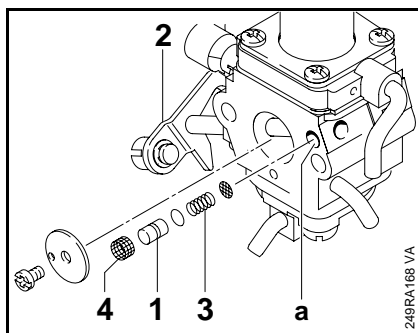
The pump diaphragm (1) and gasket (2) are held in position by the cast pegs on the flange body with idle speed screw (3).



- Gasket (1) and pump diaphragm (2) are held in place by the cast pegs on the end cover (5).
- Install the spring (4) and spring retainer (3) in the housing base (5). Fit the diaphragm (2) and gasket (1) and screw the assembly to the carburetor.

The spring retainer's integrally cast guide points toward the spring (4).

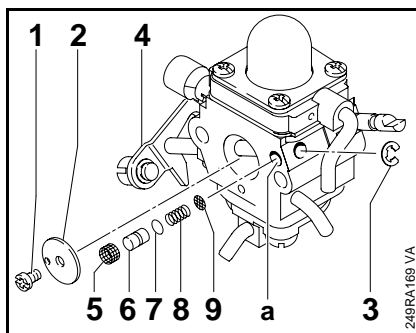
- Fit the screws and tighten them down firmly.



The carburetor is equipped with an accelerator pump.

- The piston (1) is located in the bore (a) behind the throttle shaft (2) and is held in the idle position by the spring (3).
- Filter (4) is fitted in the bore (a) in front of the throttle shaft (2) to help prevent the ingress of dust.

Perform the following operations to strip down and clean the accelerator pump:



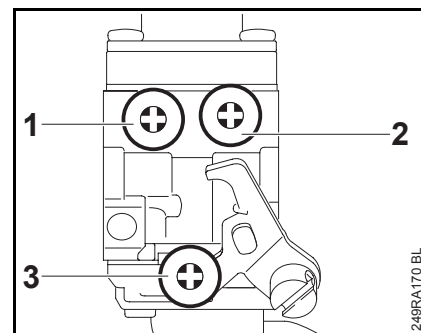
- Take out the screw (1).
- Remove the throttle shutter (2).
- Remove the E-clip (3).
- Take out the strainer (5).
- Cover the bore (a) with one finger.
- Push back the throttle shaft with lever (4) at least 15 mm until the end of the shaft is visible in the choke tube.
- Slowly expose the bore (a), take out the piston (6) with sealing ring (7) and spring (8).
- Remove the filter (9), check it for damage and contamination, clean it or replace if necessary.
- Inspect piston (6) and spring (8) for damage and replace if necessary.
- Install a new sealing ring (7) in the piston's groove.

Reassemble all other parts in the reverse sequence.

### Standard Setting


- Shut off the engine.
- Check the air filter and replace if necessary.
- Check the spark arresting screen (if fitted) and clean or replace as necessary.

The limiter caps must not be removed for the standard setting.



- Corrections to the high speed screw H (1) and low speed screw L (2) are only possible within fine limits.
- Unscrew the high speed screw (H) counterclockwise as far as stop (no more than 3/4 turn).
- Unscrew the low speed screw (L) counterclockwise as far as stop (no more than 3/4 turn).
- Start the engine and allow it to warm up.
- Use the idle speed screw LA (3) to adjust engine idle speed: Turn clockwise to increase engine speed; turn counterclockwise to reduce engine speed.

### 6.4.1 Basic Setting

- Adjust engine idle speed with the aid of a tachometer,  3.1; note that there is **an ignition spark on every revolution of the crankshaft**.
- Check idling behavior by opening the throttle several times. Make sure engine idles and accelerates smoothly.

If the engine stops while idling:


- Turn the idle speed screw clockwise until the tool begins to move. Then turn the screw back one quarter of a turn from that position.

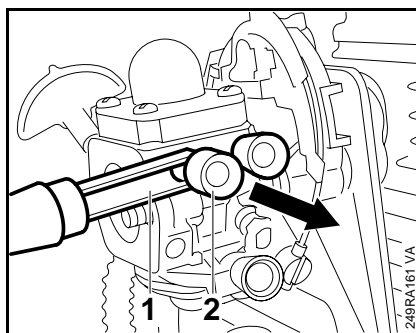
If the tool runs while the engine is idling:

- Turn idle speed screw counterclockwise until the tool stops running. Then turn the screw about another quarter turn in the same direction.

A slight correction of the setting of the high speed screw (H) may be necessary (no further than stop) if engine power is not satisfactory when operating at high altitude, sea level or after changing the cutting tool.

- Turn the high speed screw H clockwise (leaner) at high altitude or counterclockwise (richer) at sea level.

The limiter caps only need to be removed from the screws if it is necessary to replace the high speed screw (H) or low speed screw (L), clean the carburetor or carry out the basic setting,  6.4.1.

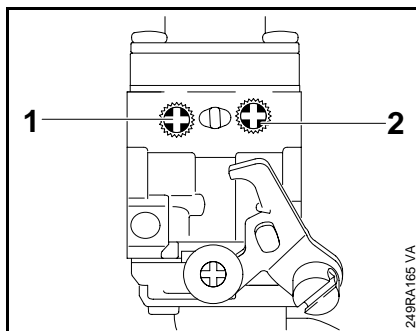


Remove the limiter caps to carry out the basic setting:

- Push the puller 5910 890 4501 (1), with the groove facing you, between the limiter cap (2) and carburetor body.
- Pry off the cap. If the limiter cap is stuck on the adjusting screw, turn the puller over so that its groove faces the carburetor body. Pry off the limiter cap.

The basic setting must be carried out after removing the limiter caps.

Do not re-install used caps because they may have been damaged during the removal process.



- Carefully screw the high speed screw H (1) and low speed screw L (2) clockwise down onto their seats.

The basic setting is carried out with the high speed screw **H** and the low speed screw **L** as follows:

#### **FS 90; FC 90, 95; KM 90 (C1Q-S110)**

- Open the high speed screw **H** 1 turn counterclockwise.
- Open the low speed screw **L** 3.5 turns counterclockwise.

#### **FS/FC/KM 100, 110; HT 100, 101 (C1Q-S72, C1Q-S81, C1Q-S88)**

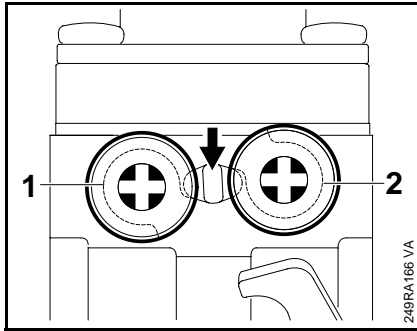
- Open the high speed screw **H** 2 turns counterclockwise.
- Open the low speed screw **L** 3 turns counterclockwise.

#### **FS/KM 130 (C1Q-S98)**

- Open the high speed screw **H** 4 turns counterclockwise.
- Open the low speed screw **L** 2 3/8 turns counterclockwise.

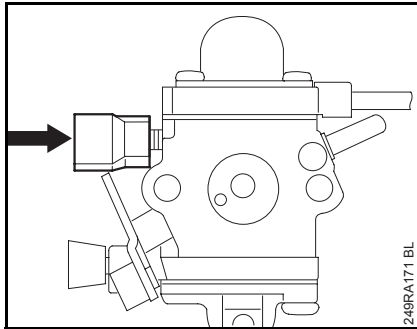
## 6.5 Tank Vent

### 6.5.1 Checking Operation



#### All models

- Place the **new** limiter caps on the screws (1 and 2) so they are positioned against the rich stop (arrow).



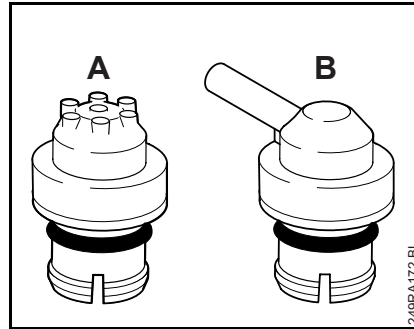
- Push limiter caps onto the screws **to the second noticeable stop** (until dimension "a" is 5 mm). Limiter caps must not butt against the carburetor body.

– Adjust engine idle speed, 6.4

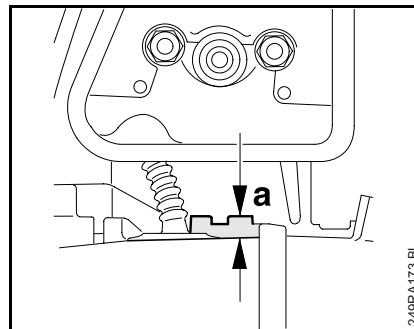
Correct operation of the carburetor is only possible if atmospheric pressure and internal fuel tank pressure are equal at all times. This is ensured by the tank vent.

In the event of trouble with the carburetor or the fuel supply system, always check the tank vent.

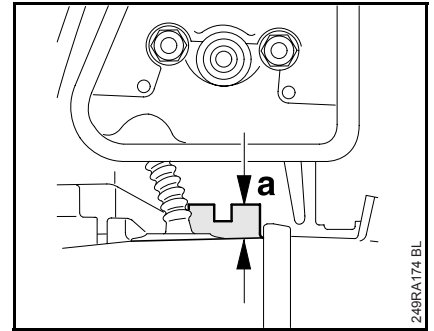
There are two types of tank vents:



- Tank vent (A) without return line.
- Tank vent (B) with connection to return line on the clean air side of the air filter.



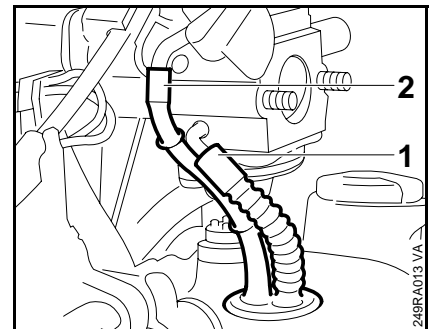
- Only tank vent (A) without return line may be installed in fuel tanks with a **2.2 mm** shoulder (a).



- A tank vent with return line (B) may be installed or retrofitted in fuel tanks with a **5.2 mm** shoulder (a).

Check function of tank vent by carrying out pressure and vacuum tests on fuel tank via the fuel hoses.

Perform the following operations:




- Pull both fuel hoses (1 and 2) off the carburetor.
- Seal fuel hose (1) with a suitable plug.




## 6.5.2 Replacing Tank Vent

### Vacuum test


- Connect hose (2) to vacuum pump 0000 850 3501 and test fuel tank under vacuum.

Equalization of pressure takes place via the tank vent. There must be no build-up of vacuum in the tank. If the tank vent does not operate properly, replace it together with the O-ring,  6.5.2.

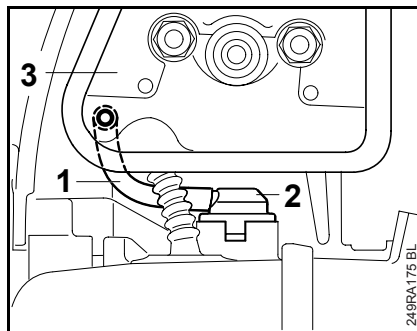
### Pressure test

- Connect the carburetor and crankcase tester 1106 850 2905 to fuel hose (2),  6.2.1
- Pump air into the tank with the rubber bulb until the pressure gauge shows a reading of approx. 0.5 bar. If this pressure remains constant for at least 20 seconds, the tank and tank vent are airtight. If the pressure drops, find the leak and replace either the tank ( 6.6.3) or the tank vent ( 6.5.2).
- After completing the test, disconnect the tester and reassemble all parts.

Remove the faulty tank vent.

- Pull both fuel hoses off the carburetor,  6.5.1

### Tank vent with return line




- Pull hose (1) of tank vent (2) off the filter housing (3).

### Both tank vent systems

- **Carefully** pry the tank vent out of the tank.

Do not reuse the old tank vent.

- Fit a new O-ring on the tank vent.
- Coat O-ring and bead of new tank vent with press fluid,  12.
- Center the new tank vent in the bore and push it home as far as stop – it must snap into position.


### Tank vent with return line

- Push hose (1) onto stub on filter housing (3).

Installing tank vent with return line in a machine that has a filter housing without stub:

- Pull hose (1) off the tank vent.

### Both tank vent systems


- Test new tank vent for leaks,  6.5.1
- Fit both fuel hoses on the carburetor.

## 6.6 Fuel Supply


The diaphragm pump draws fuel out of the tank and into the carburetor via the fuel hose.

Any impurities mixed with the fuel are retained by the pickup body. The fine pores of the pickup body eventually become clogged with minute particles of dirt. This restricts the passage of fuel and results in fuel starvation.

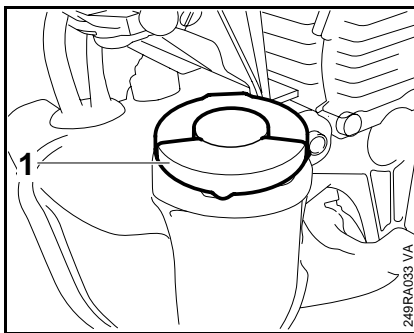
In the event of trouble with the fuel supply system, always check the fuel tank and the pickup body first.

Clean the fuel tank if necessary,  6.6.1.

After completing servicing work on the fuel system:

- Test the fuel system for leaks,  6.5.1

### 6.6.1 Cleaning the Fuel Tank



- Unscrew the filler cap (1) and drain the tank.
- Pour a small amount of clean gasoline into the tank and shake the unit vigorously.
- Open the tank again and drain it.

Dispose of fuel properly at an approved disposal site.


### 6.6.2 Fuel Hoses and Pickup Body

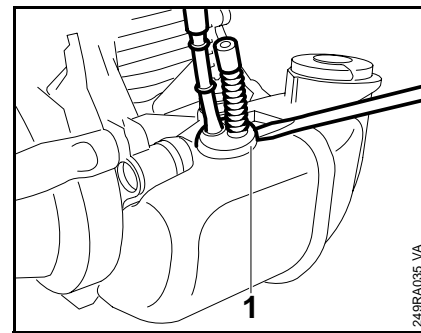
Depending on the type of fuel tank, two different fuel supply systems are installed:

**One-part system (molded hose)**, grommet and fuel hoses are in one piece.

**Multi-part system**, connector and fuel hoses are available as separate items.

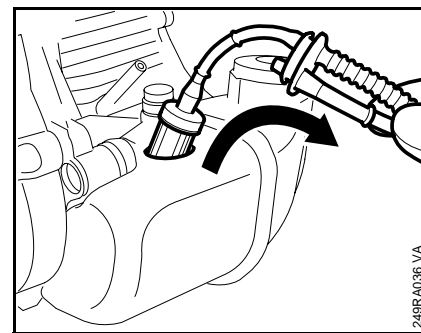
Differences in removal and installation procedures are described below.

- Pull the fuel hoses off the carburetor,  6.2.2

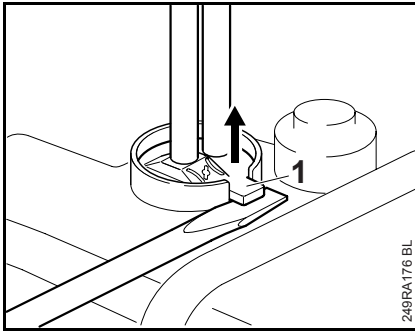


#### One-part system

- Carefully pry the grommet (1) out of the fuel tank, taking care not to damage the tank.

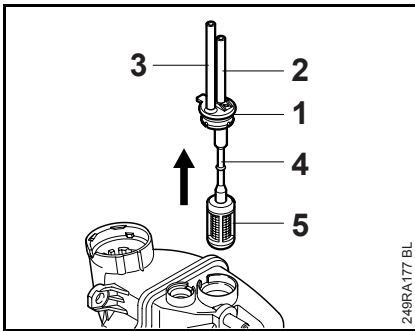


- Remove the fuel hoses with the pickup body.



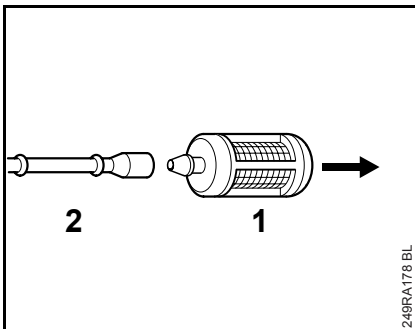
### Multi-part system

- Carefully pry the tab (1) of the connector upwards; take care not to damage the fuel.



- Pull the connector (1) with hoses (2 + 3), molded hose (4) and pickup body out of the tank.

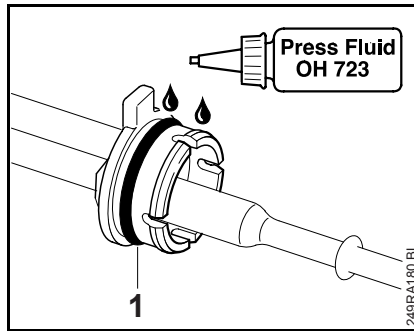
### All systems



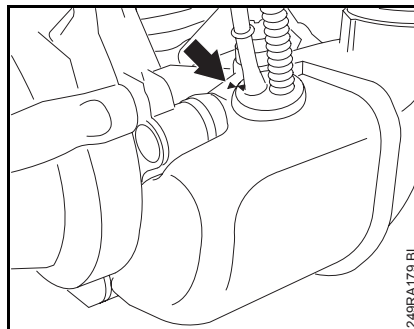
- Pull the pickup body (1) off the molded hose (2).
- Replace damaged parts. Make sure the new fuel supply system suits the machine's fuel tank.

Install in the reverse sequence.

- Attach pickup body with molded hose to connector.

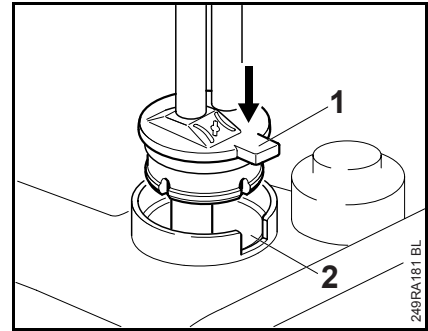


- Coat O-ring (1) and bead of connector or grommet on molded hose (one-part system) with press fluid, 12.



### One-part system

- Mark on fuel hose grommet must line up with mark on tank.

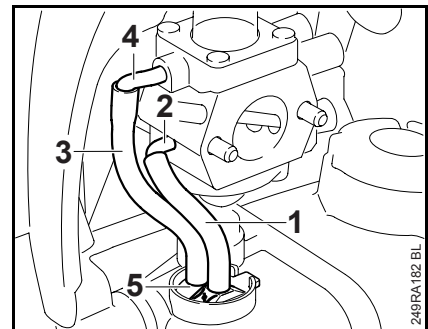


### Multi-part system







- Center the connector in the fuel tank's opening and turn it so that the tab (1) fits in the cutout (2).
- Push home the connector as far as stop – it must snap into position.

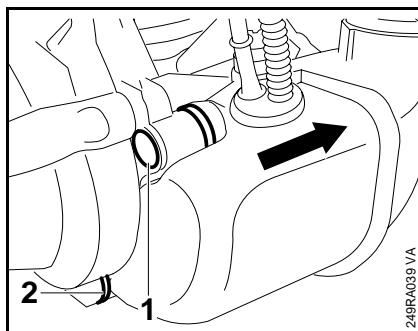
### All systems

Check that hoses are properly connected:

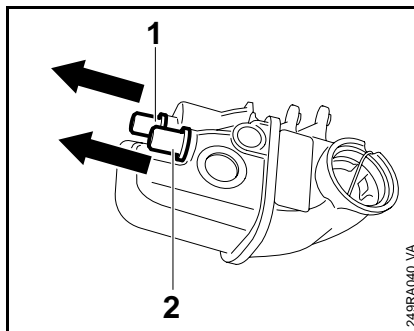


- Suction hose (1) from hose connector with choke symbol to fuel intake stub (2)
- Hose (3) from connector (4) to return stub (5)

- Drain the fuel tank.
- Remove the rewind starter,  5.2
- Remove the shroud,  5.7
- Remove the air filter,  6.1
- Pull the fuel hoses off the carburetor,  6.2.2
- Pry the fuel hose with pickup body out of the tank,  6.6.2
- Pry the tank vent out of the tank,  6.5.2
- Unscrew the fuel filler cap and remove it together with the cap retainer





- Pull out the fuel tank with sleeves (1 and 2).




- Remove the sleeves (1 and 2).

Reassemble in the reverse sequence.

The new fuel tank is supplied with a tank vent with return line and the required hose.

If the new fuel tank is combined with an original filter housing without stub for the return line ( 6.1), pull the hose off the tank vent,  6.5.2.

- Test the fuel tank for leaks,  6.5.1

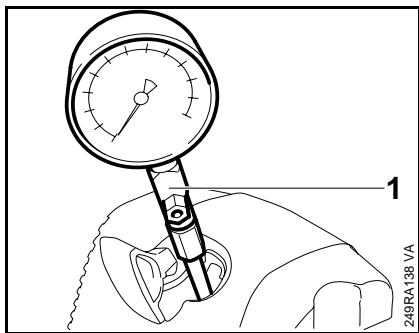
Always check and, if necessary, repair the fuel supply, carburetor, air filter and ignition system before looking for faults on the engine.

Lubricate all moving parts of the engine with oil.


Exceptions are described separately.



## 7.1 Compression Pressure



- Pull off the spark plug boot.
- Unscrew the spark plug.
- Screw compression tester 5910 850 2000 (1) into the spark plug hole.
- Move slide control to "STOP-0".
- Set choke shutter to open.
- Pull starter rope vigorously and quickly several times.
- Note compression pressure.



If the compression pressure is below 6 bar, check valve clearance and readjust if necessary,  7.2. If this produces no improvement, check the cylinder, valve seat, piston and piston rings for scores or other damage.

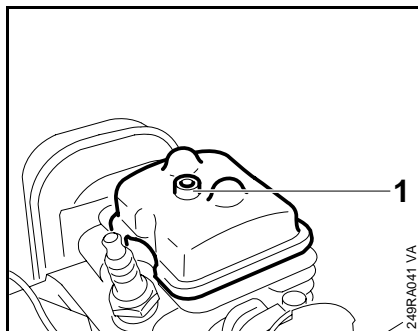
The design specification is 6...7 bar.

Reassemble in the reverse sequence.

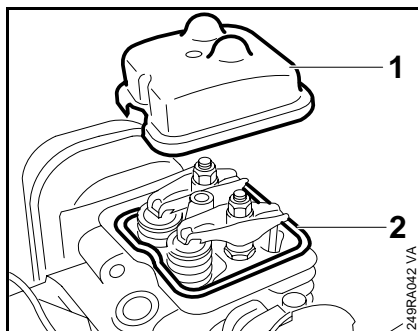
## 7.2 Checking / Adjusting Valve Clearance

Check and adjust valve clearances only when engine is cold.

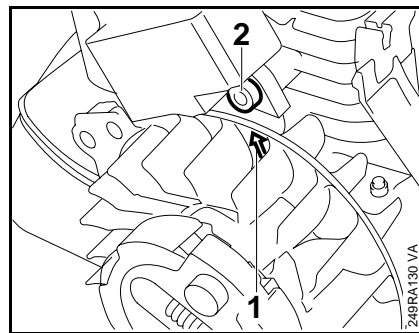
- Remove the rewind starter,  5.2
- Remove the shroud,  5.7



- Take out the screw (1).
- Remove the sealing ring.
- Unscrew the spark plug.



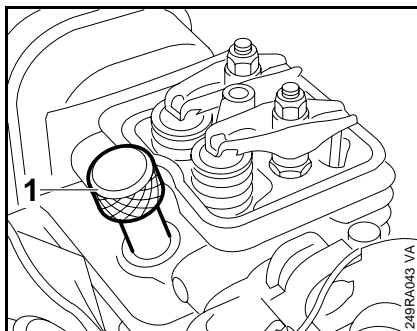
- Remove the valve cover (1).
- Remove the gasket (2).



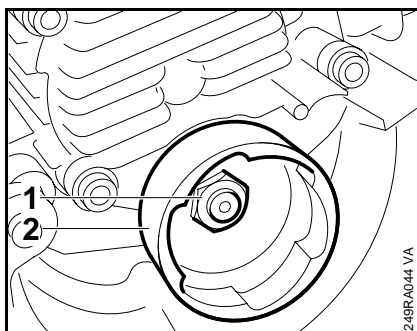
- Rotate the crankshaft until the arrow (1) is in line with the screw (2) on the right-hand side of the ignition module.

Observe rocker arms while rotating the fanwheel up to the mark. If the valves are operated by the rocker arms in this position (valve overlap), rotate the crankshaft another turn until the valves are idle and the arrow (1) lines up with the screw (2). Make sure the valves are not operated in this position by turning the crankshaft back and forth.

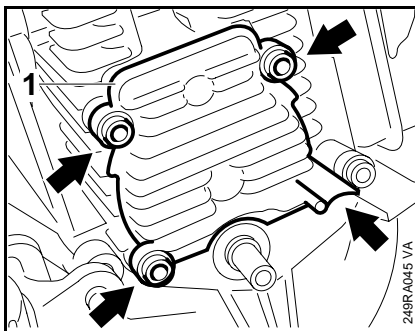
If there is no noticeable valve overlap, proceed as follows:



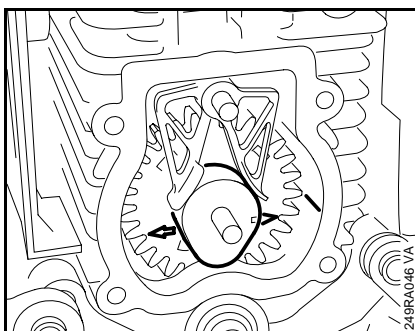
- Fit locking screw (1) 4180 890 2700 in spark plug hole.



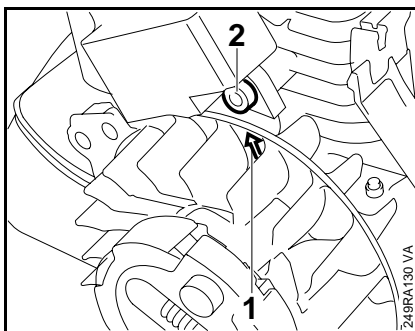
- Rotate crankshaft counter-clockwise until the piston butts against the locking screw.
- Remove the hex. nut (1).
- Remove the starter cup (2).
- Remove the locking screw.



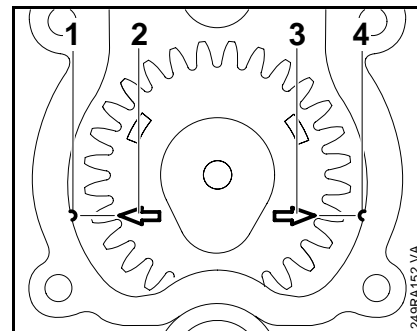
- Take out the screws (arrows).
- Carefully lift away the cam gear cover (1).



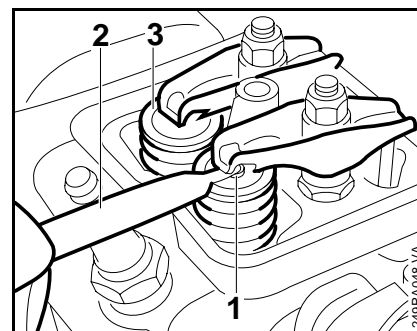
- Rotate crankshaft clockwise until cam lobe points downward.



- Check that arrow (1) lines up with the right-hand screw (2) on the ignition module.



- Marks (arrows) on (2 and 3) must line up with the notches (1 and 4) in the cylinder.

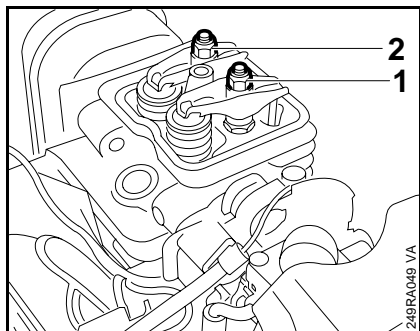


Cam gear cover must be fitted before checking and adjusting valve clearances.

- Insert feeler gauge 4180 893 6400 (2) between rocker arm and valve stem.

The feeler gauge must slip through with a certain resistance.

Inlet valve (1):  $0.10 \pm 0.02$  mm  
Exhaust valve (3):  $0.10 \pm 0.02$  mm



### Adjusting Valves

Valve clearance is adjusted with the locknuts (1 and 2).

To increase valve clearance: Turn nut counterclockwise

To reduce valve clearance: Turn nut clockwise

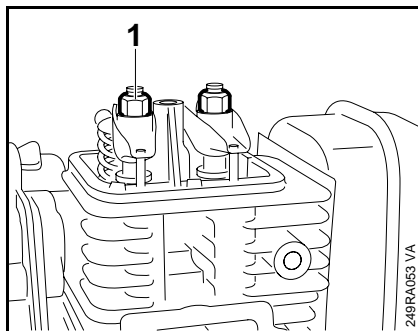
- Turn engine over several times and then check valve clearance again.

Assemble all parts in the reverse sequence.

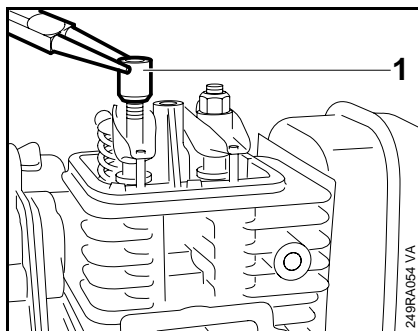
- Thoroughly clean the sealing faces on the cylinder and cover.
- Apply thin coating of sealant to cylinder sealing face.

Follow maker's instructions.

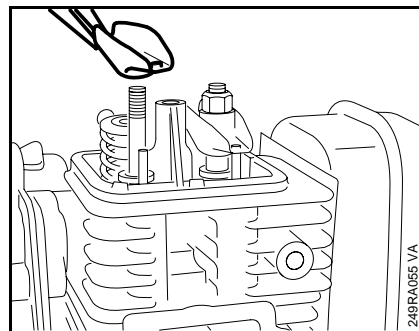
- Tighten down cam gear cover screws in crosswise pattern, 3.4
- Install new gasket for valve cover.
- Use new sealing ring for spline socket head screw.
- Tighten down valve cover screw firmly, 3.4
- Tighten down nut on starter cup, 3.4
- Tighten down spark plug, 3.4



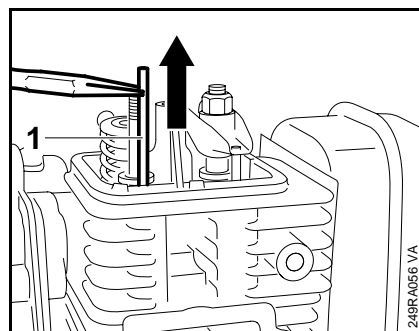
- Remove the valve cover and cam gear cover. 7.2
- Set piston to T.D.C., 7.2
- Remove the locknut (1).



- Remove the sleeve (1).



- Remove the rocker arm.



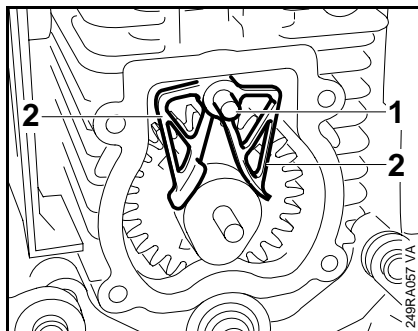
- Take out the pushrod (1).

Reassemble in the reverse sequence.

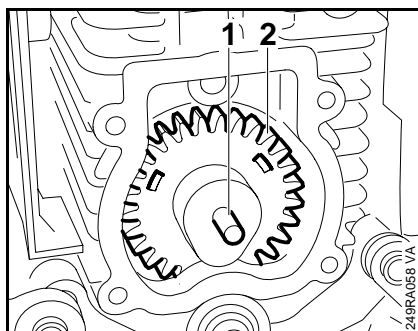
**Make sure that the pushrod is firmly seated in the rocker arm and cam follower.**

- Adjust valves, 7.2

## 7.4 Cam Followers, Cam Gear



- Remove the pushrods, 7.3
- Pull out the pin (1).
- Remove the cam followers (2).



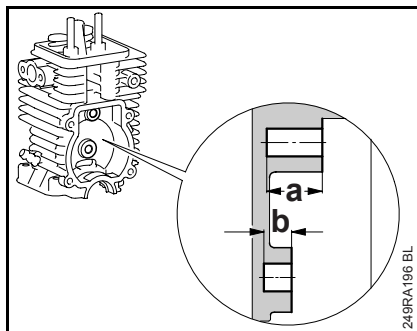
- Pull out the pin (1).
- Remove the cam gear (2).
- Inspect the removed parts and replace as necessary.

Install in the reverse sequence.

- Check the lengths of the pins (1).

Different lengths of pins have to be installed to suit the type of cylinder.

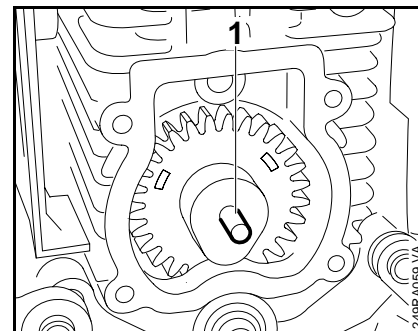
Cylinders have bearing bores of different depths:



- Permissible combinations are as follows:

Bore	Length of pin
a = 12.2 mm	28 mm
b = 5.7 mm	

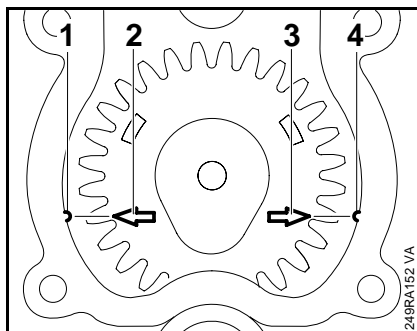
a = 10.7 mm	26.5 mm
b = 4.2 mm	



- Install the pin (1).

The marks must not move out of position while the cam gear is being fitted.

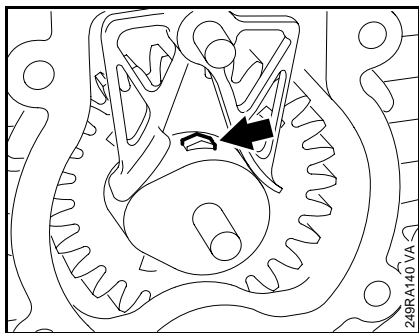
- Install the left-hand cam follower first. It controls the inlet valve.



- Set crankshaft to T.D.C., 7.8.3

- Fit the cam gear so that the marks (1 and 2) and (3 and 4) are in alignment.

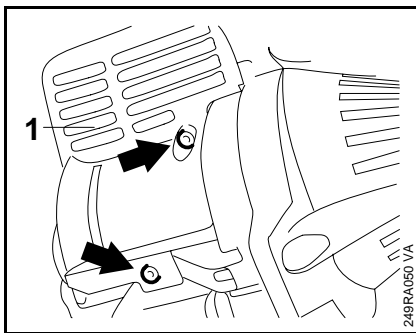
## 7.4.1 Decompression System



- Remove cam gear cover, 7.2
- Check free movement and function of decompression system lever (arrow).
- Lever must project about 2 mm from cam.
- Push decompression system lever counterclockwise. The lever must move freely and retract fully.

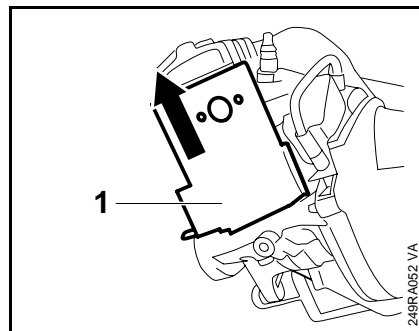
If the lever is difficult to move, worn or not visible, install a new cam gear.

## 7.5 Muffler / Spark Arresting Screen



- Remove the rewind starter, 5.2
- Remove the shroud, 5.7
- Take out the screws (arrows).
- Remove the cover (1).

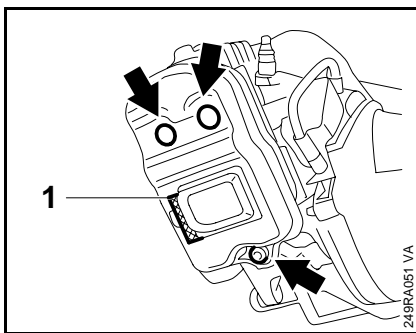
- To remove the muffler, take out the screws (arrows).



- Remove the exhaust gasket (1).

Reassemble in the reverse sequence.

- Use a new exhaust gasket.
- Tighten down muffler mounting screws, 3.4
- Tighten down the cover screws, 3.4



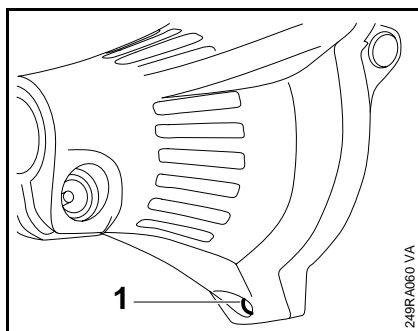
- Take out the screw, if fitted, lift up the spark arresting screen (1) and pull it out.
- Clean the spark arresting screen or, if necessary, install a new one.

## 7.6 Clutch

### 7.6.1 Removing and Disassembling

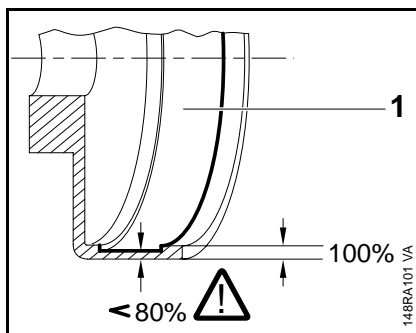
Troubleshooting chart, 4.1.

- Remove the shroud, 5.2
- Remove the throttle cable and wiring of ignition module, 8.2.2



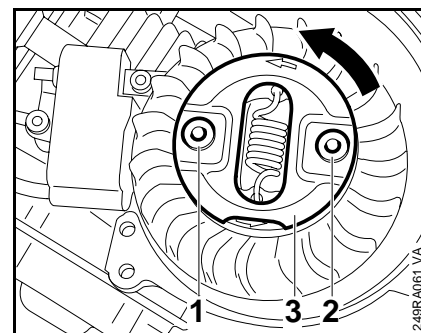
- Take the screw (1) out of the fan housing and remove the engine.

Support the engine so that it does not drop when the screw is removed.

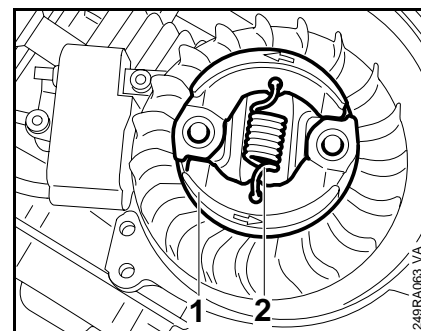


- Inspect the clutch drum (1). There should be no scores or signs of excessive wear.

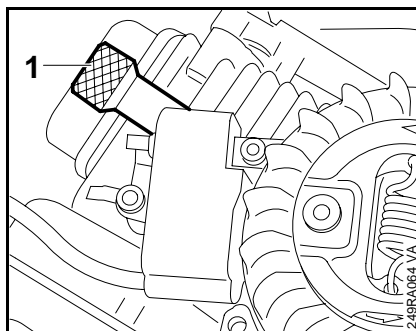
If there are signs of serious wear on the inside diameter of the clutch drum, check the remaining wall thickness. If it is less than about 80% of the original thickness, fit a new clutch drum, 7.6.3.



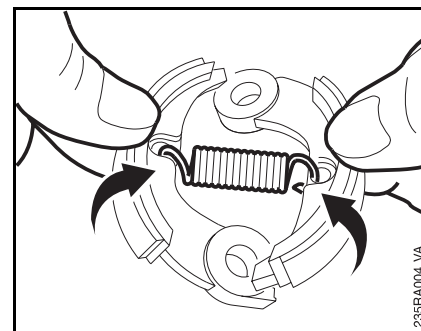
- Take out the clutch shoe screws (1 and 2).
- Remove the cover plate (3).



- Remove the clutch shoes (1) together with the spring (2) and lower cover plate.



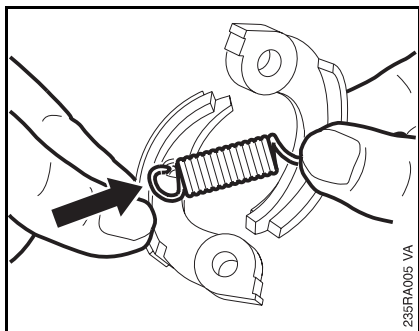
- Remove the spark plug. Fit the locking screw 4180 890 2700. Rotate the crankshaft counter-clockwise until the piston butts against the locking screw.



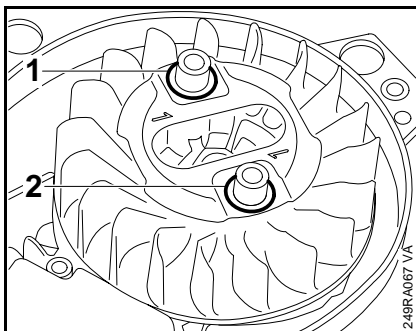
- Tilt the clutch shoes and unhook the spring.

Clutch shoes must always be replaced in pairs.

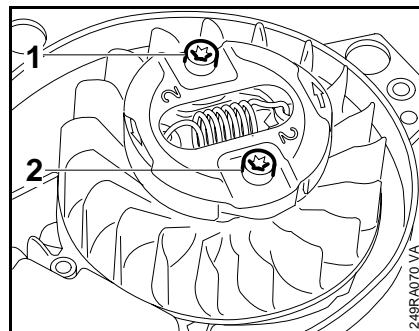
## 7.6.2 Assembling and Installing



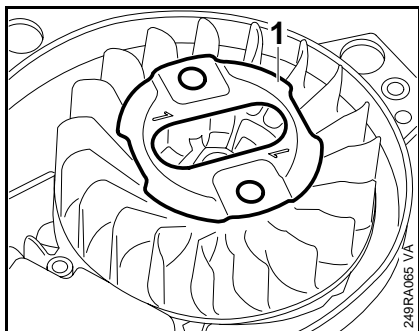
- Attach spring to clutch shoes.



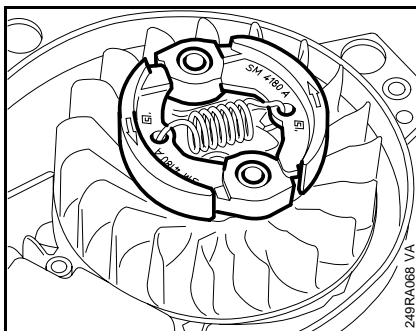
- Fit corrugated washers (1 and 2).



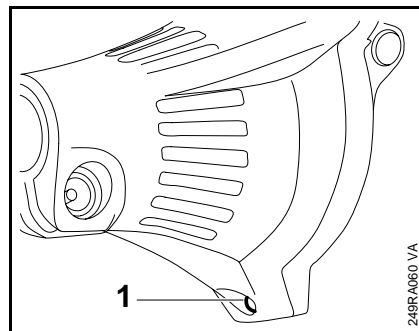
- Fit screws (1 and 2) and tighten them down firmly, 3.4



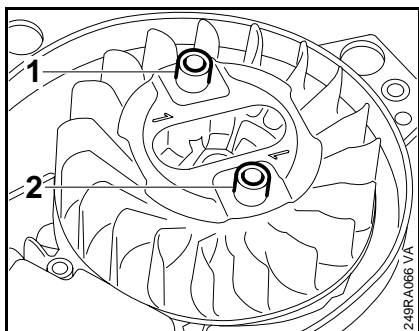
- Place cover plate (1), with "1" facing up, on the flywheel.



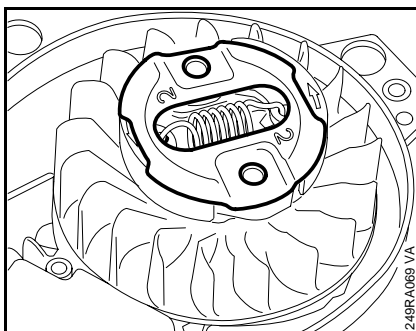
- Fit clutch shoes with lettering facing up.



- Fit the fan housing on the engine.
- Tighten down the screw (1) firmly, 3.4

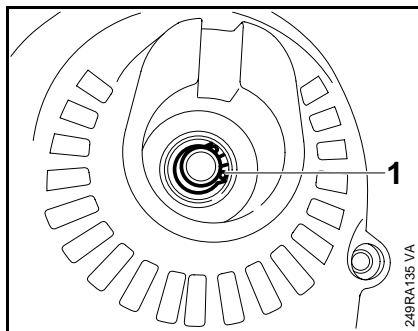



- Fit sleeves (1 and 2) on cover plate and press into the flywheel.



- Fit the cover plate with "2" facing up.

### 7.6.3 Clutch Drum and Bearing



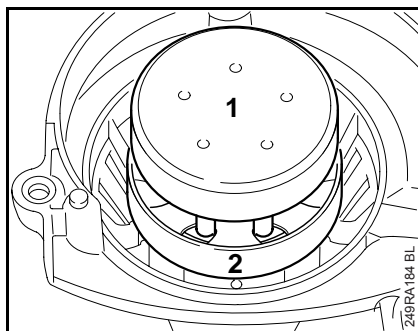
- Remove the engine,  7.6.1
- Removing the retaining ring (1).

Different fan housings are fitted to the powerhead:

Pressure die cast fan housing.

Polymer fan housing.

Differences in removal and installation procedures are described below.

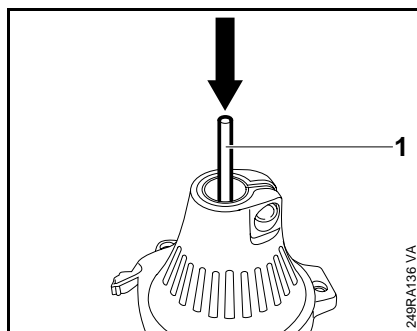


#### Polymer fan housing

- Support the ball bearing at the clutch drum (2) side with removal tool 5910 890 4602 (1).

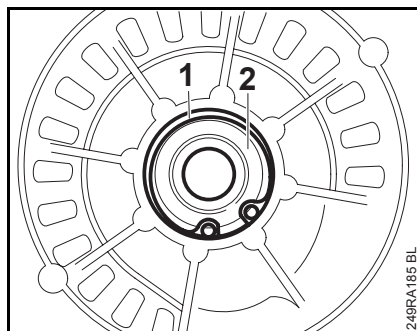
- Turn the removal tool and fan housing over – so that the fan housing rests on the removal tool.

#### All models



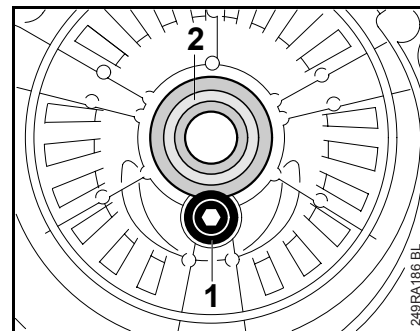
- Insert extension 4180 893 4400 (1) in square hole and use bench press to push out clutch drum in direction of engine.

Remove the bearing as follows:



#### Pressure die cast fan housing

- Remove the retaining ring (1).
- Press out the ball bearing (2) in the direction of the engine.



#### Polymer fan housing:

- Take out the screw (1).
- Use a suitable arbor to press the ball bearing (2) out of its seat.

#### All models

- Replace all damaged parts.

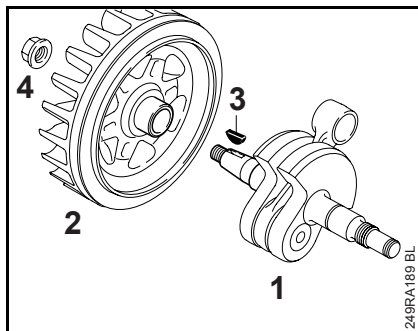
Reassemble in the reverse sequence.

- Install new ball bearing with press arbor 4119 893 7200.

#### Polymer fan housing

- Fit the screw (1),  3.4





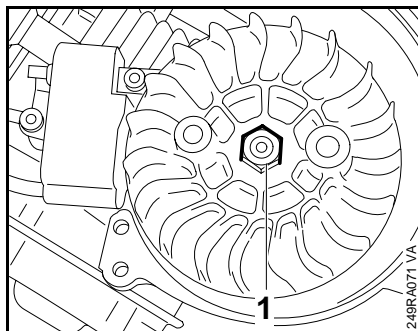
- Crankshaft (1) and flywheel (2) are an interference fit.

The crankshaft and flywheel are pressed together with such force that the flywheel cannot turn on the crankshaft.

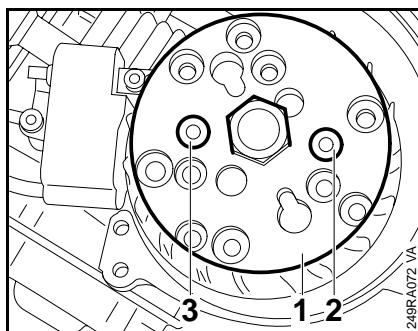
**For this reason the mating surfaces must be free from grease and oil.**

The conical interference fit ensures the flywheel is exactly centered, and runs smoothly with a minimum of runout.

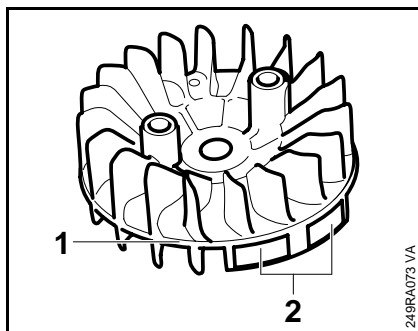
- The key (3) is used only to position the flywheel in relation to the crankshaft (correct ignition timing).
- Nut (4) pushes the flywheel (2) onto the crankshaft (1) to achieve the required interference fit.



- Remove the clutch, [7.6.1](#)
- Remove the hex. nut (1).



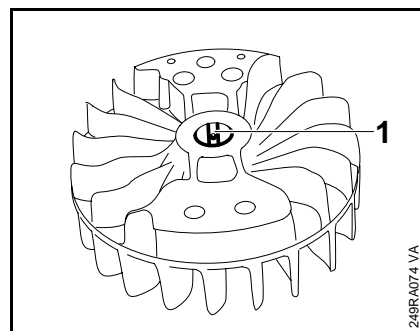
- Mount puller (1) 4119 890 4501 to the flywheel with M6 x 25 screws (2 and 3), and pull off the flywheel.



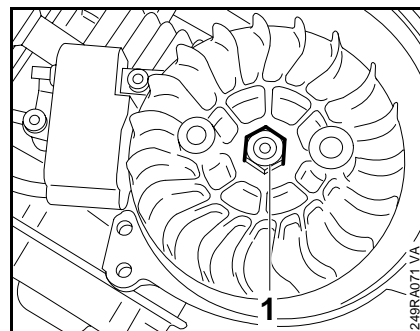
- Flywheel (1) and magnet poles (2) must show no signs of cracks or other damage. If this is the case, install a new flywheel.

## Installing the flywheel

- Clean the stub of the crankshaft and the flywheel hub bore with a standard commercial, solvent-based degreasant containing no chlorinated or halogenated hydrocarbons, [12](#)
- Check Woodruff key or integrally cast key for damage and replace key or flywheel if necessary.



- Fit the flywheel in position.
- Check that flywheel is properly seated. Key (1) in flywheel must engage slot in crankshaft stub.




- Fit the hex. nut (1) and tighten it down firmly, [3.4](#)
- Install the clutch, [7.6.2](#)

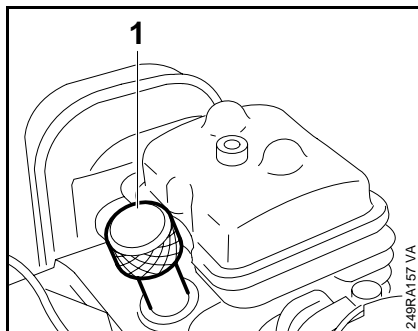
## 7.8 Crankshaft

### 7.8.1 Replacing the Oil Seals

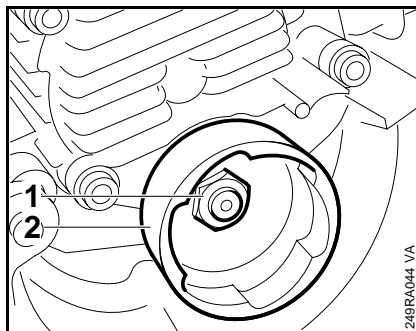
It is not necessary to disassemble the complete engine to replace leaking oil seals.

#### Starter side

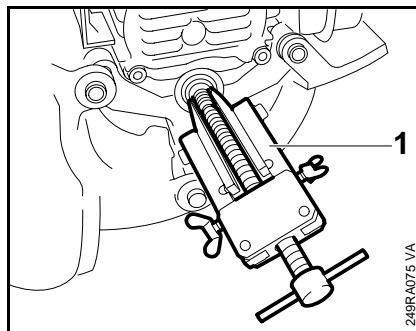
- Remove the rewind starter,  5.2



- Use combination wrench 4180 890 3400 to remove the spark plug. Fit locking screw 4180 890 2700 (1). Rotate crankshaft counter-clockwise until the piston butts against the locking screw.





- Remove the hex. nut (1).
- Remove the starter cup (2).

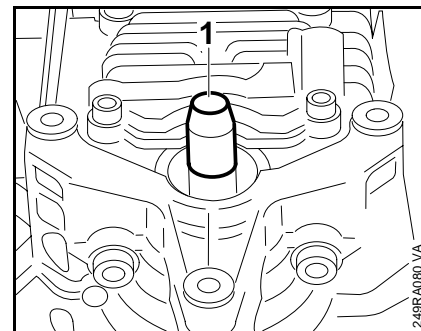


- Apply puller 5910 890 4400 (1) with No. 3.1 jaws and clamp the arms.
- Pull out the oil seal.

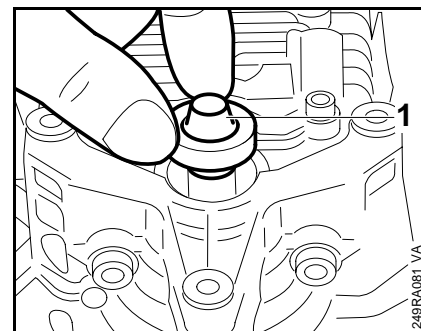
Take special care not to damage the crankshaft stub.

#### Installing oil seal at starter side

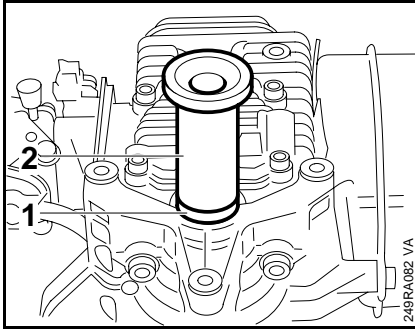
- Inspect crankshaft running face for scores.
- Clean sealing face in crankcase.
- Lubricate sealing lips of oil seal with grease,  12
- Apply thin coating of sealant to outside diameter of oil seal,  12



- Slip the installing sleeve 4112 893 2400 (1) over the end of the crankshaft.



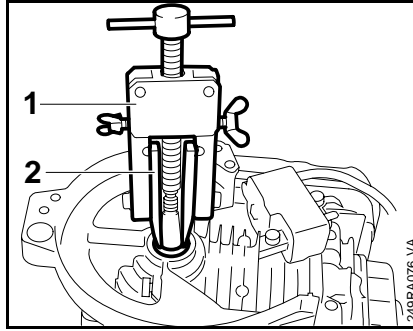
- Push the oil seal (1) over the installing sleeve and up against the crankcase.
- Note installed position: Closed side of the oil seal (1) must face rewind starter.



- Press home the oil seal (1) with press sleeve 1115 893 4600 (2) so that it is flush with the crankcase.
- Remove the installing sleeve (2) and press sleeve (1).
- Fit the starter cup on the crankshaft.
- Tighten down hex. nut, 3.4
- Remove the locking screw 4180 890 2700. Fit spark plug and tighten down firmly, 3.4
- Install the rewind starter, 5.2
- Install the shroud, 5.7

### Flywheel side

- Remove the rewind starter, 5.2.
- Remove the shroud, 5.7
- Remove complete clutch, 7.6.1
- Remove the flywheel, 7.7

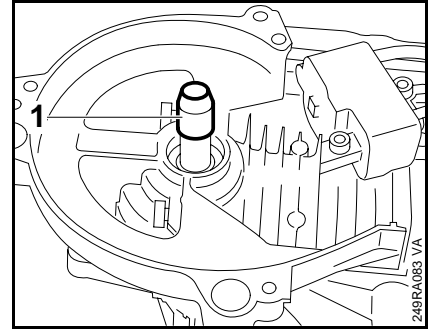


- Apply puller 4112 890 4400 (1) with No. 3.1 jaws (2) and clamp the arms.
- Pull out the oil seal.

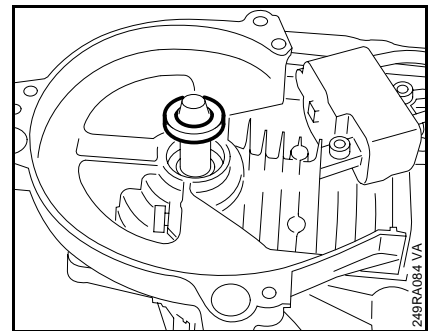
Take special care not to damage the crankshaft stub.

### Installing oil seal at flywheel side

- Inspect crankshaft running face for scores.
- Clean the sealing face in the crankcase and lubricate sealing lip of oil seal with grease, 12



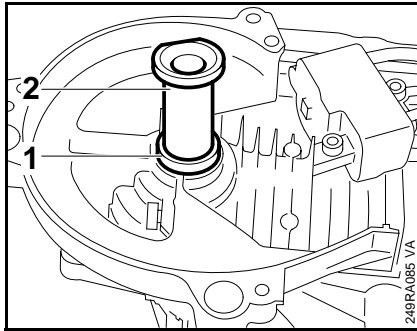
- Slip installing sleeve 4112 893 2400 (1) over the end of the crankshaft.
- Lubricate sealing lips of oil seal with grease, 12
- Apply thin coating of sealant to outside diameter of oil seal, 12



- Push on the oil seal as far as the crankcase.

Note the installed position: Closed side of the oil seal must face flywheel.

## 7.8.2 Crankcase, Lower Half

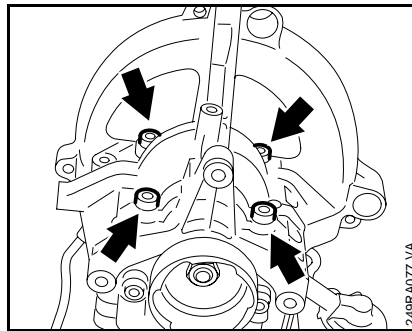


- Press home the oil seal (1) with press sleeve 4112 893 2401(2) so that it is flush with the crankcase.
- Remove the installing sleeve.
- Fit the flywheel, 7.7
- Install the clutch, 7.6.2
- Remove the locking screw 4180 890 2700.
- Fit spark plug and tighten it down firmly, 3.4
- Fit the shroud, 5.7
- Fit the rewind starter, 5.2

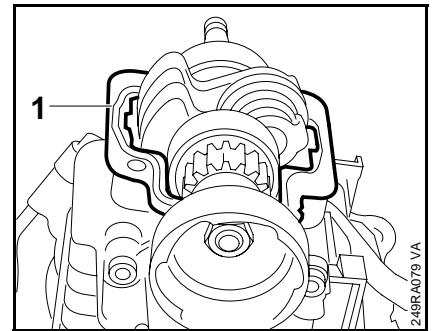
- Remove the tank, 6.6.3
- Remove the muffler, 7.5
- Remove the flywheel, 7.7

Do not take the crankshaft out of the bearings because this will alter cam gear timing, 7.4.

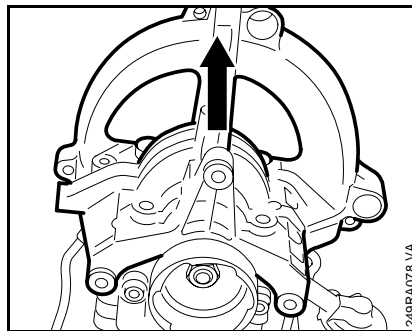
Install in the reverse sequence.



- Take out the screws (arrows).

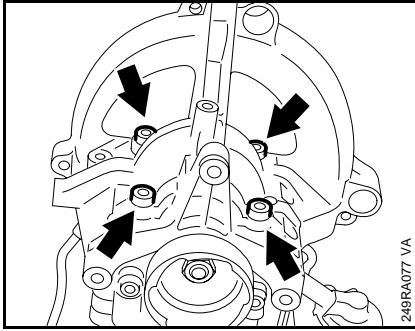


- Clean the sealing face (1) of the upper half of the crankcase and the oil seals.
- Clean the sealing face of the lower half of the crankcase.
- Check oil seals for leaks, damage and cracks.



- Lift away the lower half of the crankcase.

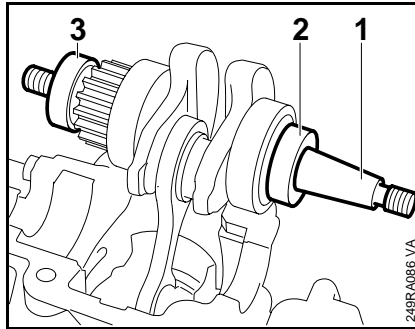
### 7.8.3 Crankshaft



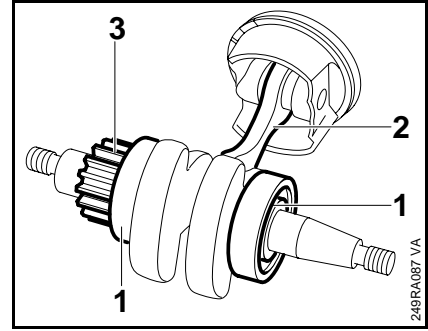
- Apply thin coating of sealant to gaskets faces, 12
- Tighten down screws (arrows) in crosswise pattern, 3.4

Always check and, if necessary, repair the fuel system, carburetor, air filter and ignition system before looking for faults on the engine, 4.1.

- Remove the lower half of the crankcase, 7.8.2

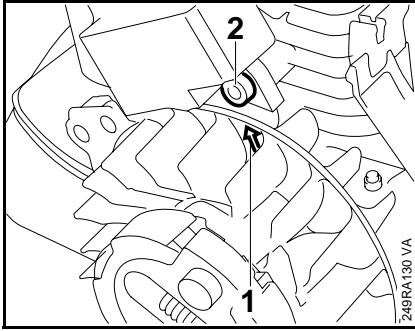


- Lift the crankshaft (1) and pull the piston out of the cylinder at the same time.
- Pull off the oil seals (2 and 3).
- Inspect cylinder running face for signs of damage and serious scores. Install new cylinder if necessary, 7.10




- Examine ball bearings (1), connecting rod (2) and gear (3).
- If one of these parts is damaged, install a new crankshaft assembly.
- Coat piston and piston rings with oil.
- Fit piston rings so that their gaps are offset 120 degrees.
- Use new oil seals.
- Lubricate sealing lips of oil seal with grease, 12
- Apply thin coating of sealant to outer diameter of oil seal, 12
- Fit oil seals over crankshaft with their open sides facing inwards.
- Carefully fit piston in the cylinder.
- Install the crankshaft with new oil seals.
- Fit lower half of crankcase, 7.8.2
- Fit the flywheel, 7.7

## 7.8.4 Piston

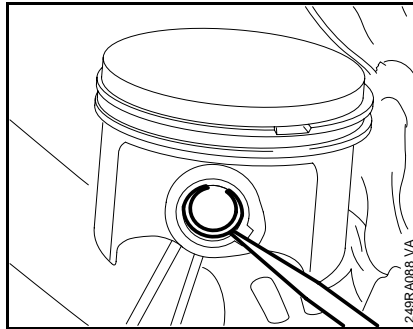


- Rotate flywheel until mark (1) is in line with screw head (2).

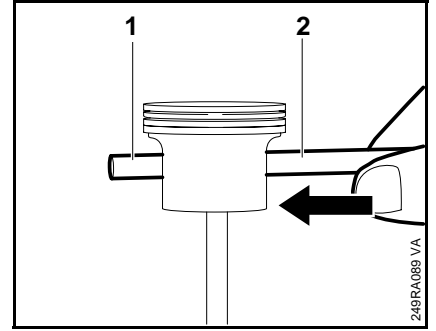
– Adjust valve timing,  7.4

– Remove the crankshaft,  7.8.3

**Important:**  
**Wear safety glasses when working with spring washers and snap rings.**

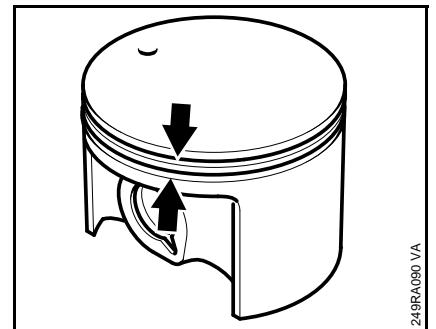



- Ease the hookless snap ring out of the groove.



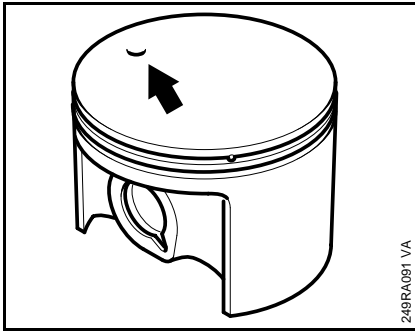
- Use the assembly drift (2) 1110 893 4700 to push the piston pin (1) out of the piston.

If the piston pin is stuck, tap the end of the drift lightly with a hammer if necessary. Hold the piston steady to ensure that no jolts are transmitted to the connecting rod.



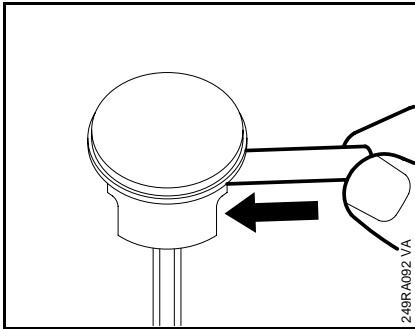
- Inspect piston rings and replace if necessary,  7.8.5

Reassemble in the reverse sequence.



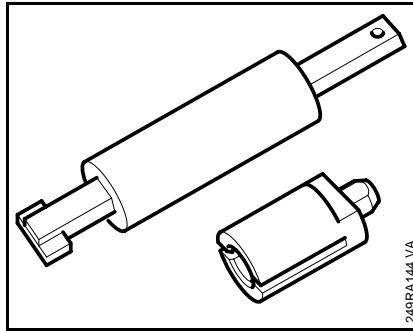
249RA091 VA

- Indentation (arrow) in piston crown faces the spark plug hole.




249RA092 VA

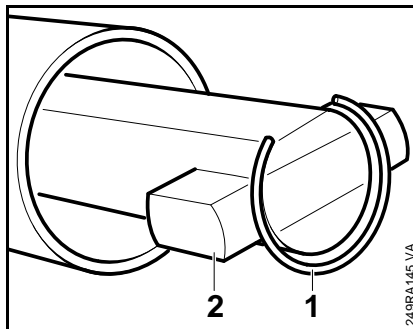
- Use the assembly drift 1114 893 4700 to push the piston pin through the piston and connecting rod.



249RA144 VA

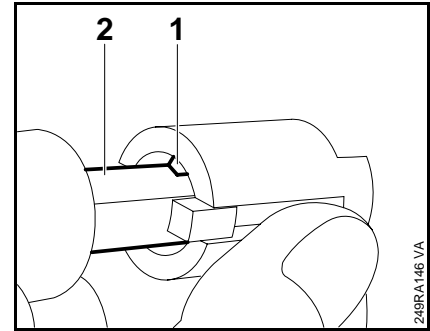
Use installing tool 5910 890 2206 to fit the snap ring,  11. If installing tool 5910 890 2208 is available, it can be equipped with a new sleeve 5910 893 1703 and used for this operation.

- Remove sleeve from the tool.



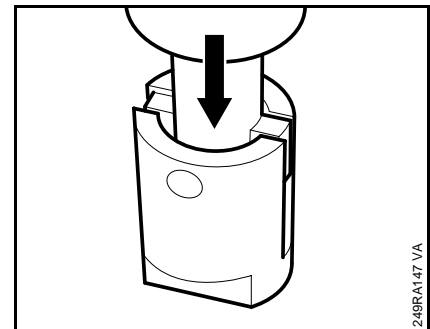
249RA145 VA

- Attach the snap ring (1) to the magnet (2) so that the snap ring gap is on the flat side of the tool's shank.



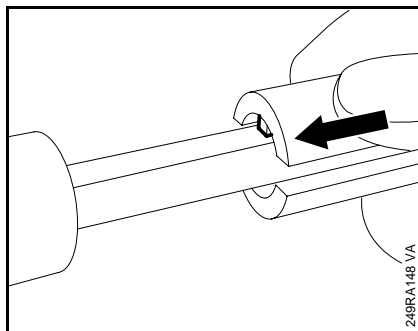
249RA146 VA

- Push the large slotted diameter of the sleeve over the magnet and snap ring. Position the sleeve so that the inner pin (1) points towards the flat face (2) of the tool's shank.



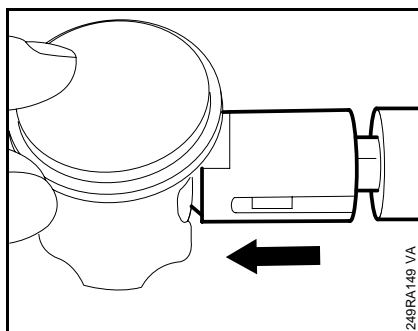
249RA147 VA

- Stand the installing tool, sleeve downward, on a flat surface (wooden board) and press vertically downwards until the sleeve butts against the tool's shoulder.

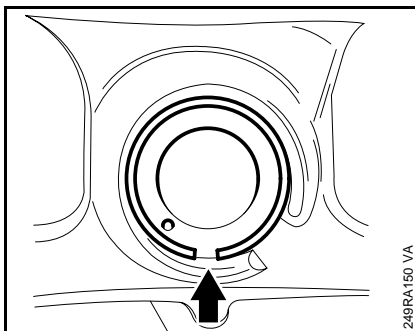


- Remove the sleeve and slip it onto the other end of the shank.

Inner pin must point towards flat face.



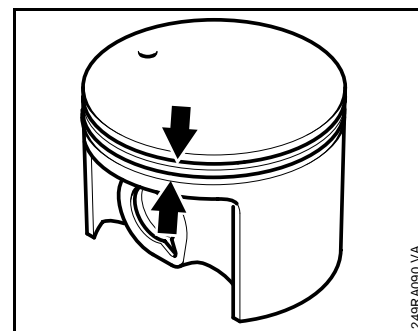
- Apply the installing tool to the piston boss, hold the piston steady, center the tool shank exactly and press home until the snap ring slips into the groove.



Fit the snap ring so that its gap is on the piston's vertical axis (it must point either up or down).

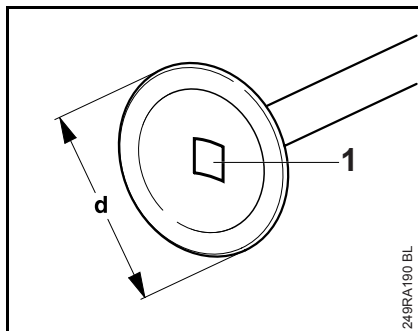
- Install the crankshaft, 7.8.3

- Remove rings from piston.



- Use a piece of old piston ring to scrape the grooves clean.
- Install new piston rings.
- Check that piston ring gaps are offset 120 degrees.
- Install the piston, 7.8.4





- Valves are distinguished by the mark (1) on the valve head and the head diameter "d".

Valves marked "A" and "B" or "●" may be used for the inlet side only.

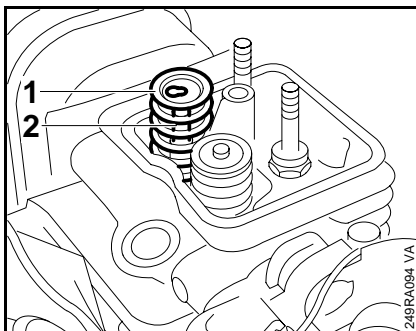
**If used valves are reinstalled, take care not to mix up the inlet and exhaust valves.**

Only valves marked "E" or "I" are available as replacements. These valves may be installed at either the inlet or exhaust side – also in older engines.

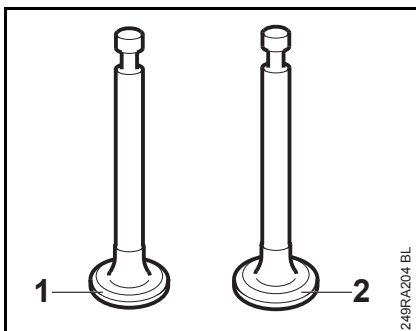
Assignment of valves to machines, 3.1.

Remove the valves as follows:

- Remove rocker arms/pushrods, 7.3
- Remove the crankshaft, 7.8.3



- Press valve spring retainer (1) down and move it sideways so that the valve stem is in the large hole.
- Remove the retainer (1) with valve spring (2).
- Take the valves out of the cylinder.



- Inspect seats on valve heads (1 and 2) and replace parts as necessary.
- Inspect valve seats in cylinder head and valve heads for any damage. Replace if necessary.

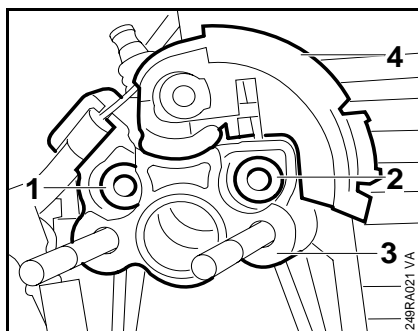
Valve spring retainer must engage properly in groove of valve stem.

Reassemble in the reverse sequence.

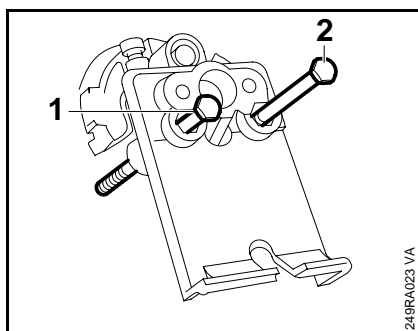
- When installing, check the valves again, 3.1

## 7.10 Upper Half of Crankcase with Cylinder

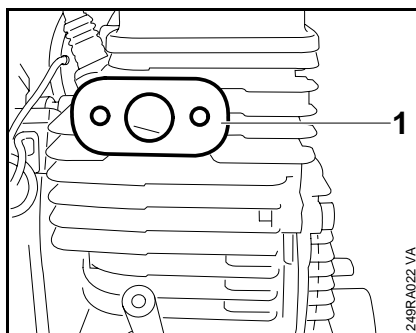
- Remove the valves, 7.9
- Remove the cam gear, 7.4
- Remove the muffler, 7.5
- Remove the carburetor, 6.2.2



- Take out the screws (1 and 2).
- Remove spacer flange (3) and tensioner for throttle cable (4).



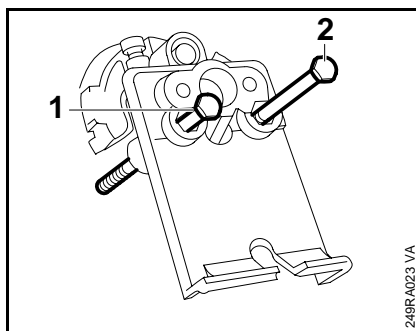
- Take screws (1 and 2) out of the spacer flange.



- Remove gasket (1) from the cylinder head.

Reassemble in the reverse sequence.

- Use a new gasket.



- Tighten down the screws (1 and 2), 3.4

Screw heads (1 and 2) must be completely recessed in the spacer flange after installation.

## 7.11 Leakage Test

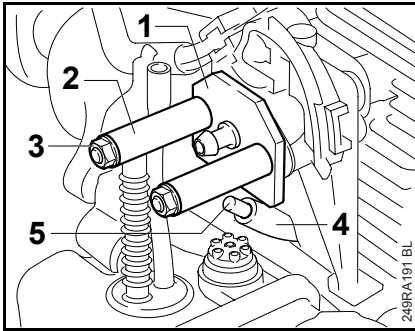
Defective oil seals and gaskets or cracks in castings are the usual causes of leaks. Such faults allow supplementary air to enter the engine and change the fuel-air mixture.

This may upset the lubricating process or cause it to fail completely.

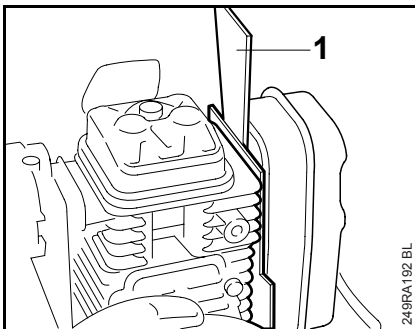
The engine can be checked for leaks with the carburetor and crankcase tester 1106 850 2905 and the vacuum pump 0000 850 3501.

### Preparations

- Set the slide control to STOP.
- Remove the shroud, 5.7
- Remove the filter cover and air filter, 6.1
- Remove the filter housing and gasket, 6.1
- Open the tank cap to release pressure and then close it again.
- Disconnect the fuel hoses and impulse hose from the carburetor, 6.2.2
- Disconnect the throttle cable, 6.2.2
- Remove the carburetor, 6.2.2



- Push the test flange (1) 1119 850 4201 into position.
- Fit the sleeves (2) 0000 963 1008 and secure them in position with the nuts (3).
- Seal the impulse hose (4) with a suitable plug (5).
- Loosen the muffler mounting screws.

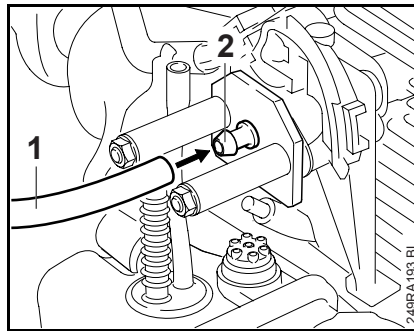


- Fit the sealing plate (1) 0000 855 8106 between the muffler and cylinder exhaust port – the sealing plate must completely cover the opening in the muffler.

- Tighten down the screws firmly.

### Vacuum test

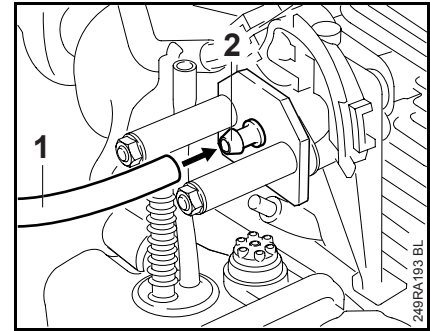
Oil seals tend to fail when subjected to a vacuum, i.e. the sealing lip lifts away from the crankshaft during the piston's induction stroke because there is no internal counter-pressure.



- Connect suction hose (1) of vacuum pump 000 850 3501 to nipple (2).
- Close the vent screw on the pump.
- Operate the pump until the pressure gauge indicates a vacuum of 0.5 bar.

If the vacuum reading remains constant, or drops to no more than 0.3 bar within 20 seconds, it can be assumed that the oil seals are in good condition.

If the vacuum drops to less than 0.3 bar within 20 seconds, the oil seals are defective and have to be replaced, 7.8.1.



### Pressure test


- Connect pressure hose (1) of tester 1106 850 2905 to nipple (2) on test flange.
- Close vent screw on the rubber bulb.
- Pump air into the crankcase with rubber bulb until the gauge indicates a pressure of 0.5 bar.

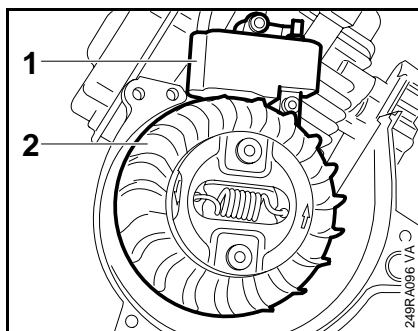
If this pressure remains constant for at least 20 seconds, the crankcase is airtight.

If the pressure drops, the leak must be located and the faulty part replaced.


- To find the leak, coat the suspect area with oil and pressurize the crankcase. Bubbles will appear if a leak exists.

Exercise extreme caution when carrying out maintenance and repair work on the ignition system. The high voltages which occur can cause serious or even fatal accidents.

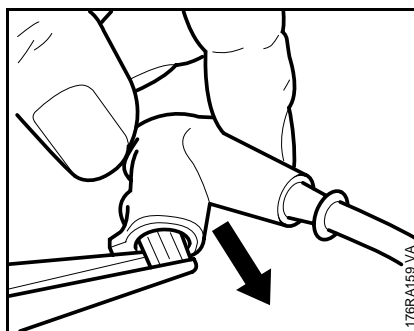
Troubleshooting on the ignition system should always begin at the spark plug,  4.3.



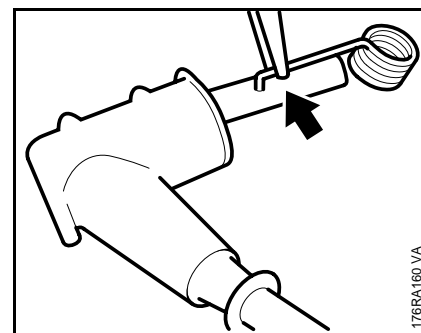
The electronic (breakerless) ignition system basically consists of an ignition module (1) and flywheel (2).

- Remove the shroud,  5.7

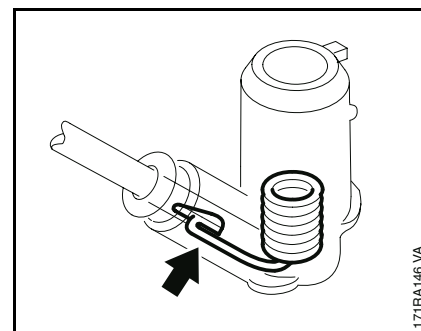
The ignition lead is molded to the ignition module.



- Use suitable pliers to pull the leg spring out of the spark plug boot.
- Unhook the leg spring from the ignition lead.
- Push the spark plug boot back a little in the direction of the ignition module.
- Take about 10 mm off the end of the ignition lead.
- Coat end of ignition lead with oil.

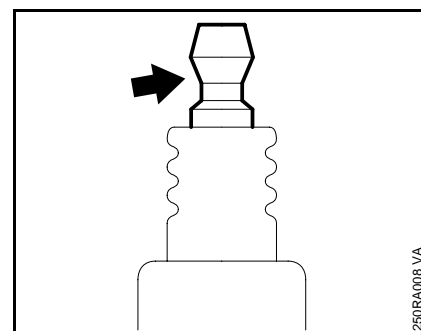


- Pinch the hook of the leg spring into the center of the lead, i.e. about 15 mm from the end of the lead.

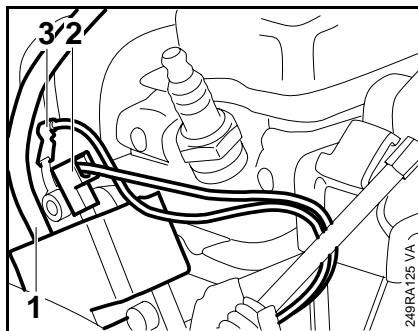


- Pull the lead back into the boot so that the leg spring locates properly inside it.

Reassemble in the reverse sequence.



- Check if spark plug has a detachable adapter nut (arrow). If so, make sure it is properly fitted and firmly tightened.



The ignition module accommodates all the components required to control ignition timing.

There are three electrical connections on the coil body:

- High voltage output with ignition lead (1)
- Connector tag (2) for the short-circuit wire
- Connector tag (3) for the ground wire

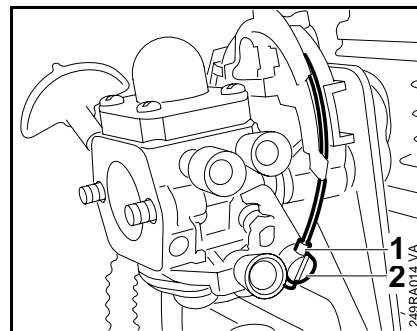
Accurate testing of the ignition module is only possible with special test equipment.


For this reason it is only necessary to carry out a spark test in the workshop.

A new ignition module must be installed if no ignition spark is obtained (after checking that wiring and stop switch are in good condition).

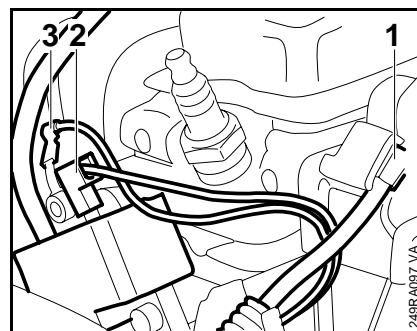
Ignition timing is **not adjustable**.

Since there is no mechanical wear in these systems, ignition timing cannot get out of adjustment. However, an internal fault in the circuit can alter the switching point in such a way that a spark test will still show the system to be in order although timing is outside the permissible tolerance. This will impair engine starting and running behavior.

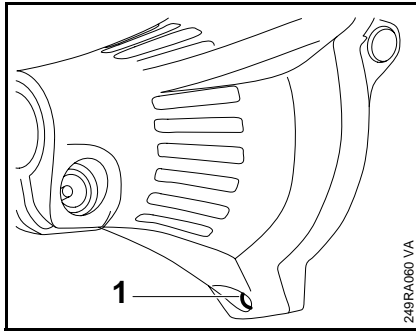


– Remove the shroud,  5.7

- Disconnect throttle cable nipple (1) from the slotted pin (2) on the throttle lever.

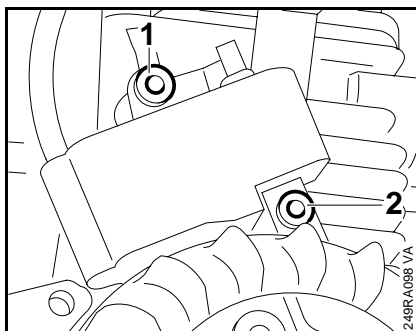


- Pry the cable (1) out of the spacer flange.
- Pull the short-circuit wire (2) and ground wire (3) off the ignition module.



- Take out screw (1) on fan housing and lift away the engine.

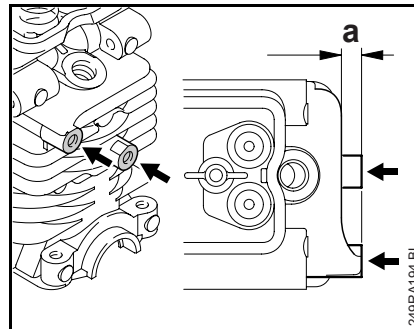
**Support the engine while removing the screw.**



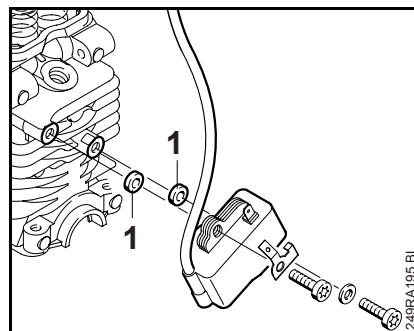
- Release and remove screw (1) with connector tag.
- Take out the screw (2) with washer.
- Remove the ignition module.

Depending on the type of cylinder, the ignition module is mounted to the cylinder with or without washers.

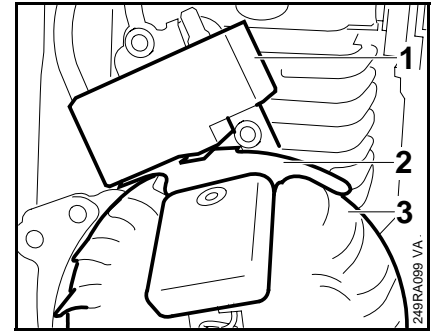
The height of the cylinder bosses for mounting the ignition module are different:




- a = 6.7 mm: Mount ignition module without washers
- a = 4.7 mm: Mount ignition module with washers



- In this case, fit the washers (1) between the cylinder and ignition module.



### Both models

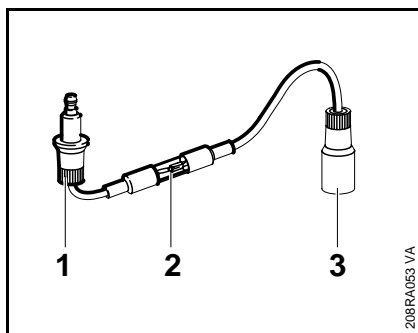
- Slide the setting gauge 4118 890 6401 (2) between the arms of the ignition module (1) and the flywheel (3).
- Press the ignition module against the setting gauge.
- Tighten down the screws,  3.4

Reassemble all other parts in the reverse sequence.

To test the ignition module, use either the ZAT 4 ignition system tester 5910 850 4503 or the ZAT 3 ignition system tester 5910 850 4520.

The ignition test refers only to a spark test, not to ignition timing.

### 8.3 Testing the Ignition System



#### Using the ZAT 4 ignition tester 5910 850 4503

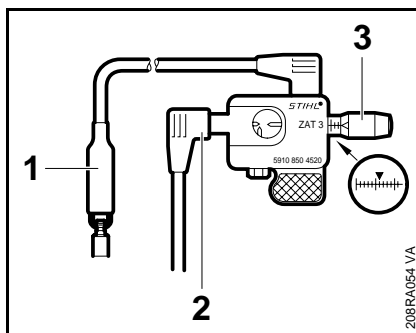
- Before starting the test, install a new spark plug in the cylinder and tighten it down firmly, 3.4
- Pull the boot off the spark plug and connect it to the input terminal (1). Push the tester's output terminal (3) onto the spark plug.
- Crank the engine quickly with the rewind starter (min. 1,000 rpm) and check spark in the tester's window (2).

The engine may start and accelerate during the test.

If a spark is visible, the ignition system is in order.

If no spark is visible in the window (2):

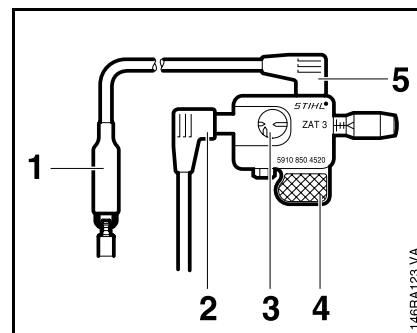
- Check ignition system with aid of troubleshooting chart, 8.4



#### Using ZAT 3 ignition system tester 5910 850 4520

- Before starting the test, install a new spark plug in the cylinder and tighten it down firmly, 3.4
- Pull the boot off the spark plug and connect it to terminal (2).
- Attach ground terminal (1) to the spark plug.

Use adjusting knob (3) to set spark gap to about 2 mm.



When using the ZAT 3, hold it only by the handle (4) or position it in a safe place. Keep fingers or other parts of body at least 1 cm away from the spark window (3), the high voltage connection (2), ground connection (5) and the ground terminal (1).

#### High voltage – risk of electrocution.

- Crank the engine quickly with the rewind starter (min. 1,000 rpm) and check spark in the tester's window (3).

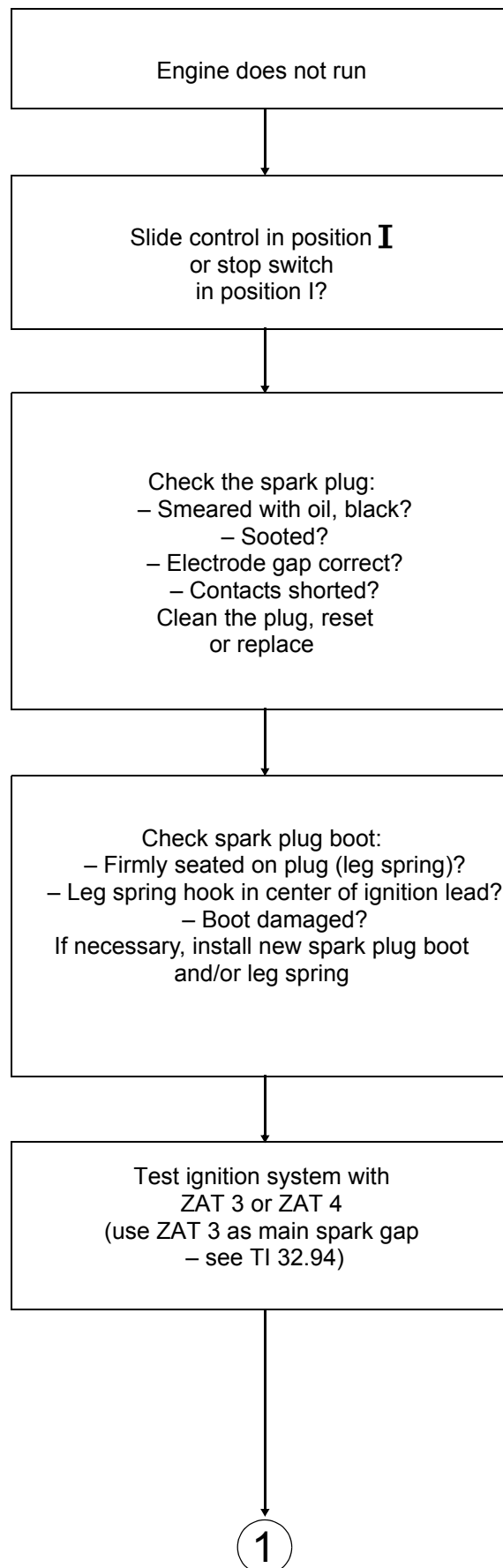
The engine may start and accelerate during the test.

If a spark is visible, the ignition system is in order.

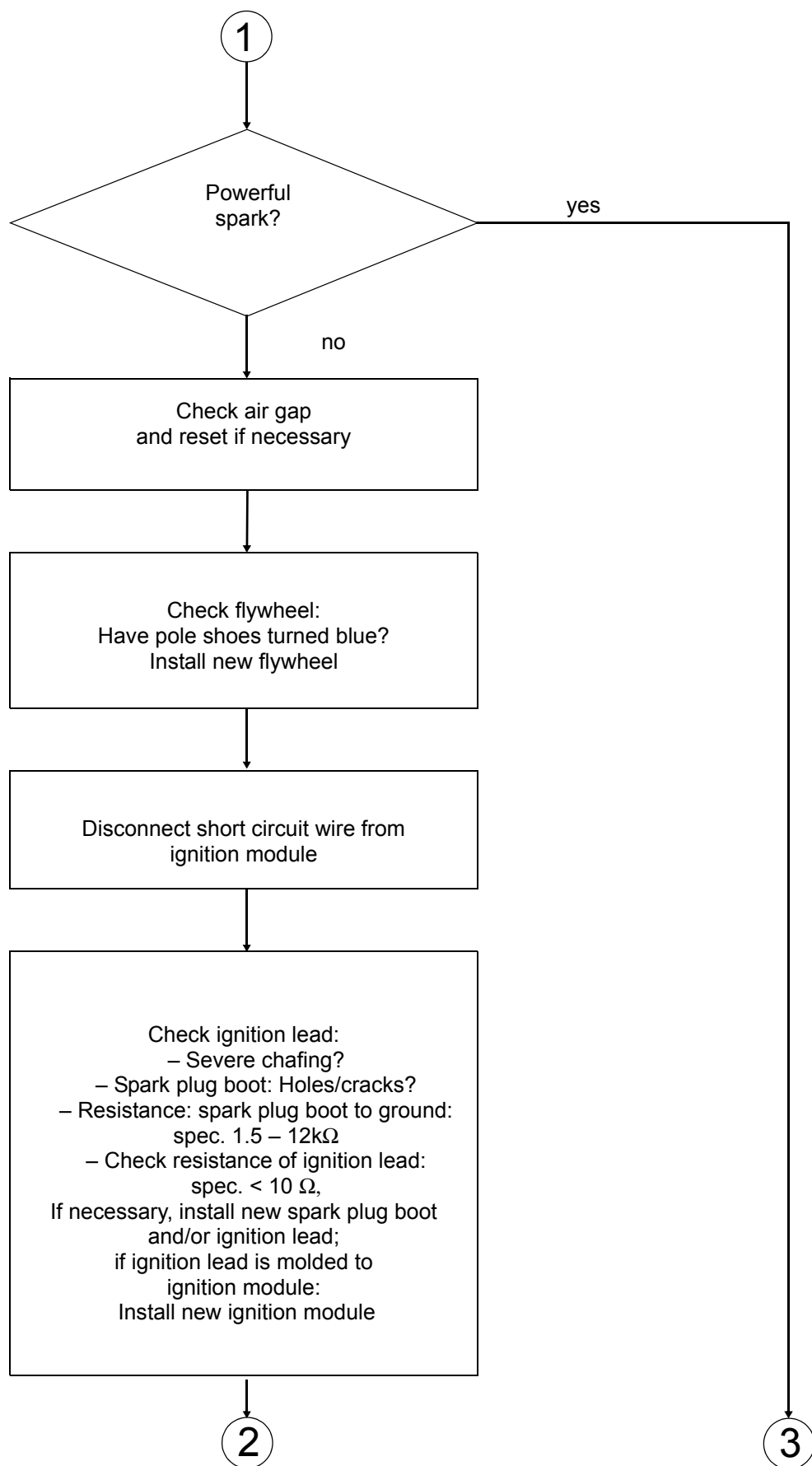
If no spark is visible in the window (3):

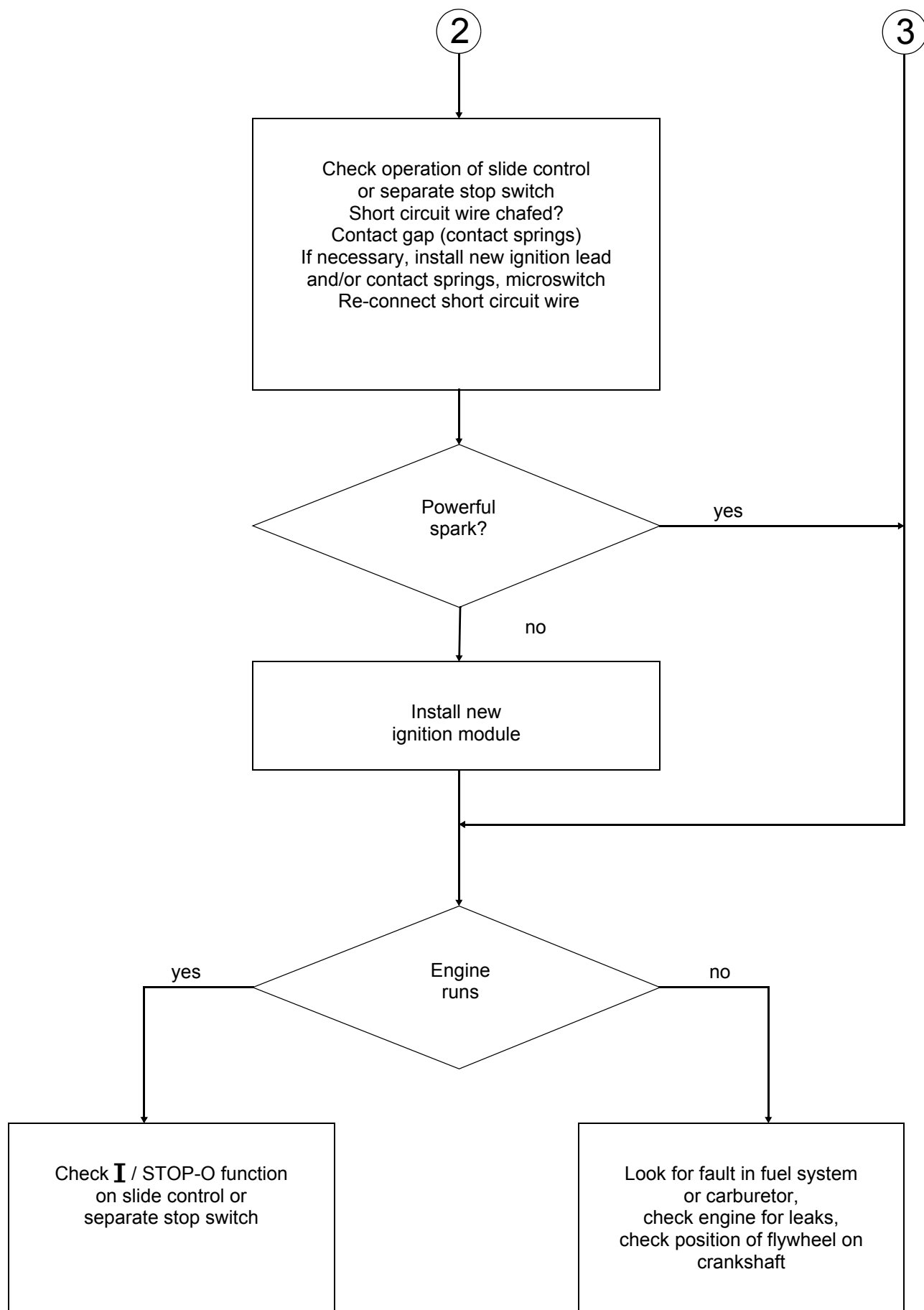
- Check ignition system with aid of troubleshooting chart, 8.4

Reassemble in the reverse sequence.



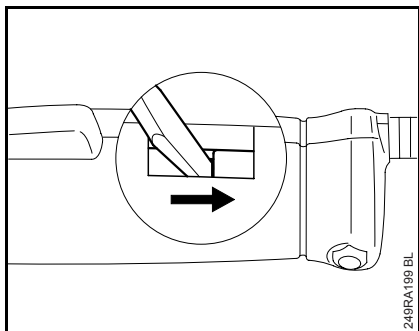




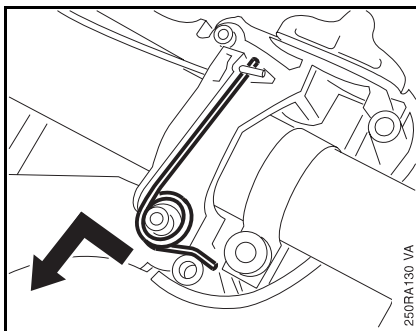


## 9. Throttle Control

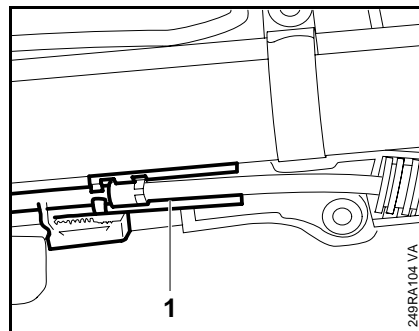
### 9.1 Throttle Trigger, Interlock Lever



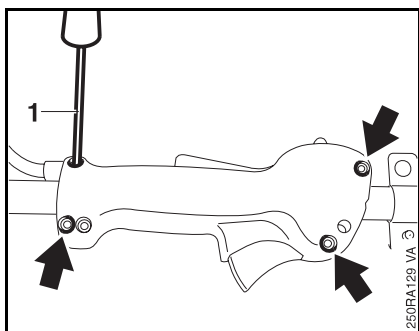
- Use a screwdriver to push the slide (if fitted) to the bottom end of the slot (arrow).



- Remove the torsion spring.

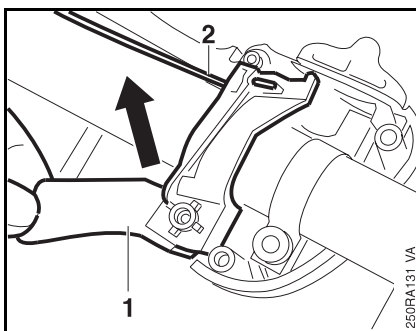


- Take the tensioner (1) out of the guide and remove the throttle cable.

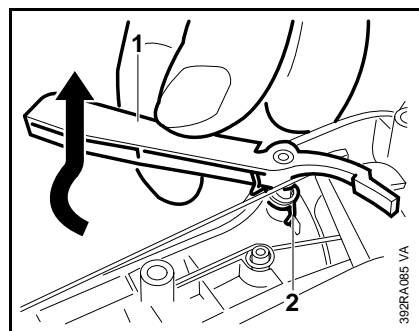


To avoid the risk of electrocution, do not start the unit while the control handle is open.

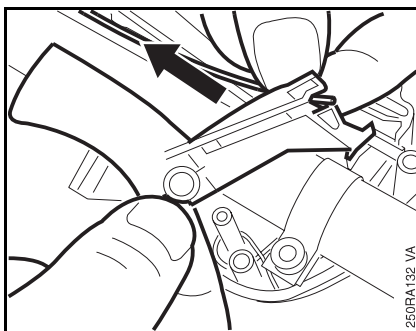
- Take out the screws (arrows).
- Remove handle molding.



- Remove the trigger (1) with attached throttle cable (2) from the pivot.

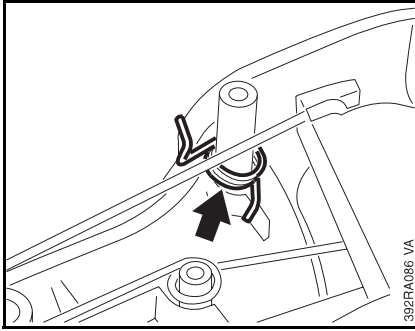


- Lift the interlock lever (1) a little and turn it to the side until the torsion spring (2) is relieved of tension.
- Pull the interlock lever off the pivot.




- Disconnect throttle cable from the trigger.

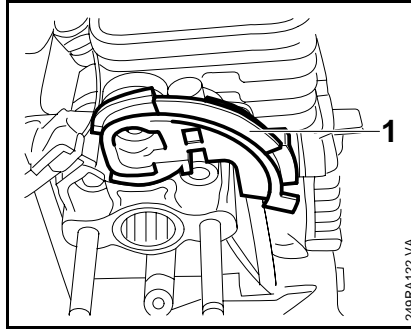
## 9.2 Tensioner



- Remove the torsion spring.

Reassemble in the reverse sequence.

- Make sure the throttle cable and protective tube are correctly positioned.
- Tighten down the screws,  3.4
- Open the throttle fully several times so that the slide automatically adjusts throttle cable tension.




- Remove the carburetor,  6.2.2

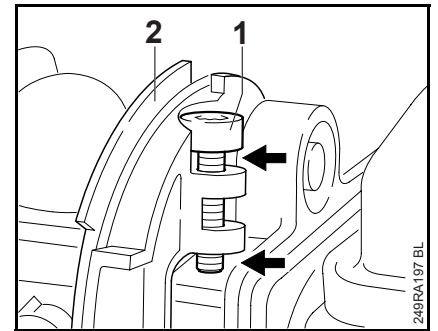
- Swing tensioner (1) vertically upwards and pull it off forwards.

Reassemble in the reverse sequence.

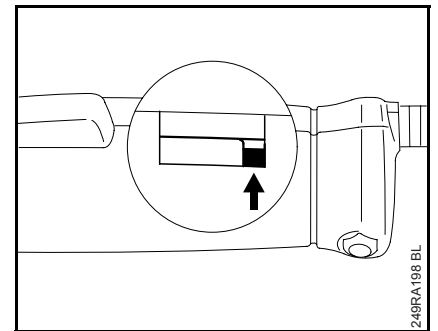
## 9.3 Adjusting Throttle Cable

### 9.3.1 Control Handle with Slide

- Remove the shroud,  5.7
- Adjust idle speed screw correctly.



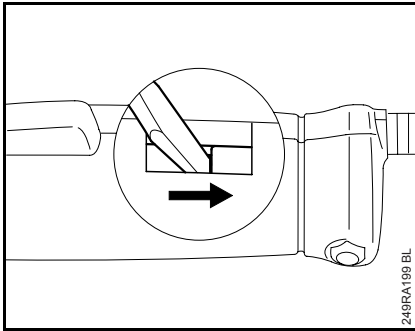
- Screw the tensioning screw (1) into the tensioner (2) until equal lengths of thread (arrows) are visible above and below the tensioner.



- Check that the slide on the control handle is at the bottom end of the slot (arrow).

If the slide is not at the end of the slot:

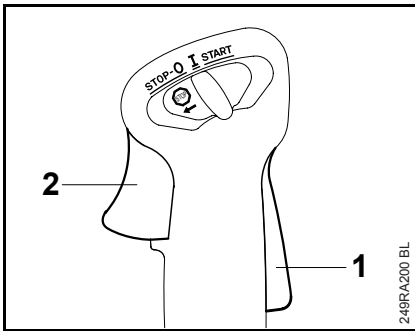
### 9.3.2 Control Handle without Slide



- Use a screwdriver to push the slide to the bottom end of the slot.

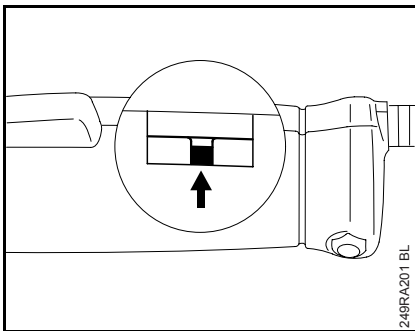
If the lever does not butt against the stop:

- Readjust tensioner until the lever butts against the respective stops.
- Adjust the throttle cable and check the adjustment again, [9.3.3](#).
- Fit the shroud.



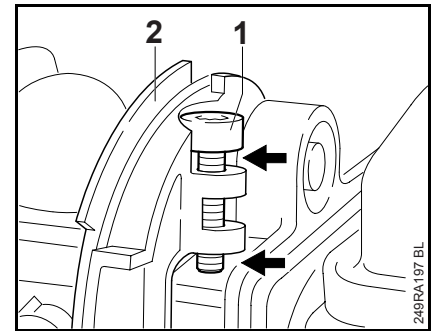
- Push down the interlock lever (1) and squeeze the throttle trigger (2) as far as stop (full throttle position).

Throttle cable tension is adjusted automatically in this process.



- The slide (arrow) moves away from the bottom of the slot.
- Check the adjustment, [9.3.3](#)

- Remove the shroud, [5.7](#)
- Adjust idle speed screw correctly.



- Screw the tensioning screw (1) into the tensioner (2) until equal lengths of thread (arrows) are visible above and below the tensioner.
- Check the adjustment, [9.3.3](#)

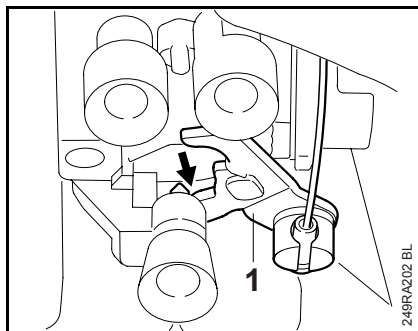
If the lever does not butt against the stop:

- Adjust the tensioning screw (1) on the tensioner (2) and check the adjustment again.
- Repeat this procedure until the lever butts against the respective stops when the throttle trigger is in the idle and full throttle positions.
- Fit the shroud.

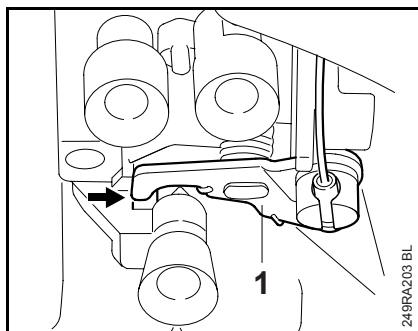
### 9.3.3 Checking Adjustment

Throttle lever must butt against the stop on the carburetor cover when the throttle trigger is squeezed as far as stop (full throttle), and butt against the idle speed screw (LA) when the throttle trigger is in the idle position.

Check as follows:

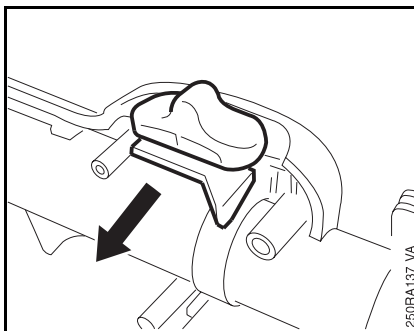


- Let go of throttle trigger (idle position). The lever (1) must butt against the idle speed screw (arrow).

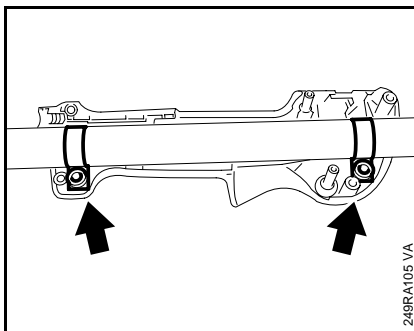


- Push down the interlock lever and pull the throttle trigger all the way (full throttle position). The lever (1) must butt against the stop (arrow).

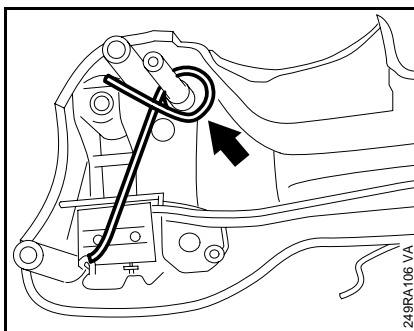
### 9.4 Slide Control



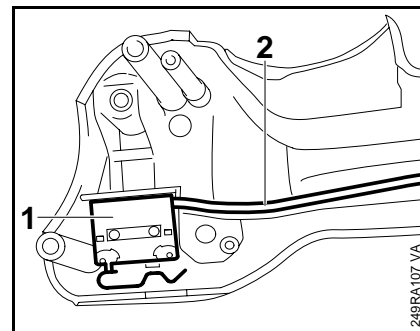
- Remove the interlock lever, 9.1
- Pull slide control off the handle molding.



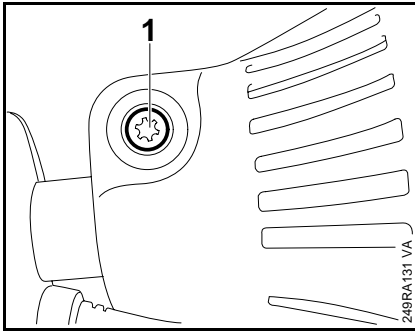
- Remove screws (arrows) from clamps.
- Remove the handle molding from the drive tube.



- Remove the torsion spring from the pivot.



- Take out the switch (1).
- Reassemble in the reverse sequence.
- Position wire for switch in the guide (2).



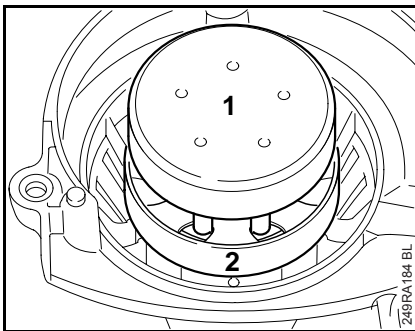
- Remove the engine, 7.6.1
- Take screw (1) out of fan housing.
- Remove the fan housing.

Different fan housings are fitted to the powerhead:

Pressure die cast fan housing.

Polymer fan housing.

Differences in removal and installation procedures for the clutch drum and bearing are described in the appropriate chapter.

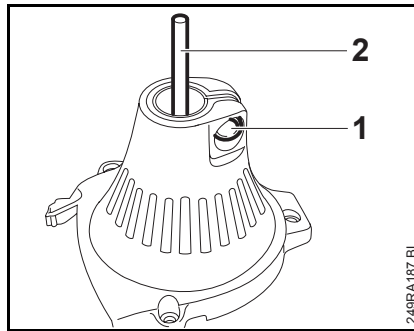


#### Polymer fan housing

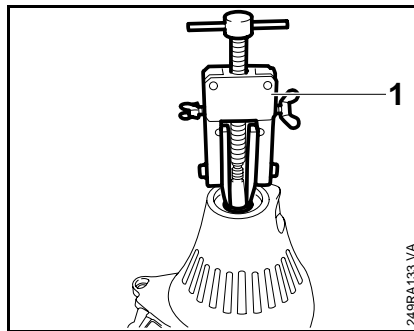
- Support the ball bearing at the clutch drum (2) side with removal tool 5910 890 4602 (1).

- Turn the removal tool and fan housing over – so that the fan housing rests on the removal tool.

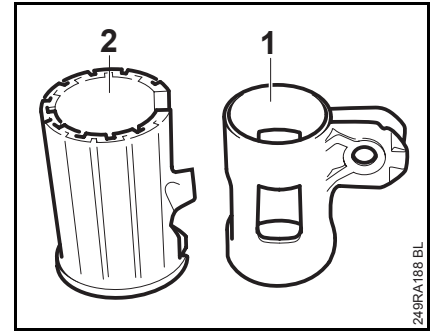
#### All models



- Remove the sleeves (1) together with rubber mounting.
- Insert extension 4180 893 4400 (2) in square hole in clutch drum.



- Apply puller 59010 890 4400 (1) with No. 2 jaws and clamp the arms.



- Jaws must engage cutouts in the clamp (1).
- Pull clamp (1) with rubber element (2) out of fan housing.
- Coat rubber element and rubber mounting of sleeves with press fluid, 12
- Push rubber element into clamp first, then press it into the fan housing.

The rubber element with clamp is recessed about 2 mm in the fan housing. It is therefore necessary to use press sleeve 4119 893 2400 for this operation.

Reassemble all other parts in the reverse sequence.

## 11. Special Servicing Tools

No.	Part Name	Part No.	Application
1	Assembly stand	5910 890 3100	Holding powerhead for servicing/repairs
2	Clamp	5910 890 8800	for No. 1
3	Compression tester	5910 850 2000	Testing valves and piston rings for leaks
4	Locking screw	4180 890 2700	Blocking the crankshaft
5	Extension	4180 893 4400	Removing AV element and clutch drum
6	Press arbor	4119 893 2400	Removing/installing clutch drum bearing
7	Installing tool	5910 890 2206	Snap ring on piston pin
8	Installing tool	5910 890 2208	Snap ring on piston pin
9	- with sleeve	5910 893 1703	
10	Carburetor and crankcase tester	1106 850 2905	Testing crankcase and carburetor for leaks
11	Vacuum pump	0000 850 3501	Testing crankcase for leaks
12	Feeler gauge	4180 893 6400	Adjusting valve clearance
13	Puller	4119 890 4501	Removing fanwheel
14	Puller	5910 890 4400	Universal puller
	- Jaws (with No. 2 profile)		Removing AV element
	- Jaws (with No. 3.1 profile)		Removing oil seals
15	Installing sleeve	4112 893 2400	Installing oil seal
16	Press sleeve	4112 893 2401	Installing oil seal at starter side
17	Press sleeve	1115 893 4600	Installing oil seal at clutch side
18	Wrench, 13mm	5910 893 5608	Removing starter cup / fanwheel
19	Combination wrench	4180 890 3400	Spark plug
20	Assembly drift	1108 893 4700	Removing piston pin
21	Assembly drift	1114 893 4700	Installing piston pin
22	Setting gauge	4118 890 6401	Setting air gap for ignition
23	Screwdriver	5910 890 2301	Screws
24	Test line	1110 141 8600	Carburetor leakage test
25	Nipple	0000 855 9200	Carburetor leakage test
26	Removing tool	5910 890 4602	Removing clutch drum
27	Puller	5910 890 4501	Removing limiter cap
28	Test flange	1119 850 4201	Leakage test
29	Sleeve	0000 963 1008	Leakage test
30	Sealing plate	0000 855 8106	Sealing exhaust port
31	Ignition system tester ZAT 4	5910 850 4503	Testing ignition
32	Ignition system tester ZAT 3	5910 850 4520	Testing ignition
33	Press arbor	4119 893 7200	Installing clutch drum bearing



## 12. Special Accessories

No.	Part Name	Part No.	Application
1	Lubricating grease (225 g tube)	0781 120 1111	Oil seals
2	Press fluid OH 723 (50 ml and 100 ml bottle)	0781 957 9000	Rubber elements of AV system Fuel line connector Grommet on molded hose (one-part system)
3	STIHL special lubricant	0781 417 1315	Bearing bore in rope rotor, rewind spring in rope rotor
4	Dirko HT red sealant (90 g tube)	0783 830 2000	Crankcase sealing faces
5	Electrician's repair kit	5910 007 1050	Electrical system
6	Set of screws	5910 007 1060	Screwed joints
7	Standard commercial, solvent- based degreasant containing no chlorinated or halogenate hydrocarbons		Cleaning crankshaft stub and flywheel taper

